Fish Populations of Carnation Creek and Other Barkley Sound Streams 1985-1986

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ABSTRACT

Andersen, B. C. 1987. Fish populations of Carnation Creek and other Barkley Sound streams 1985-1986. Can. Data Rep. Fish. Aquat. Sci. 657: 59 p.

A summary of fish population data, collected as part of the Carnation Creek Experimental Watershed Project, is presented. The time period covered is from January 1985 to December 1986.

Key words: Watershed Study, coho, chum, steelhead, cutthroat, sculpin, logging, Carnation Creek

RESUME

Andersen, B. C. 1987. Fish populations of Carnation Creek and other Barkley Sound streams 1985-1986. Can. Data Rep. Fish. Aquat. Sci. 657: 59 p.

On présente un résumé des données sur les populations de poisson recueillies de janvier 1985 à décembre 1986 dans le cadre du "Carnation Creek Experimental Watershed Project".

Mots-clés: étude de bassin versant, coho, kéta, truite arc-en-ciel anadrome, truite fardée, chabot, exploitation des forêts, ruisseau Carnation

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INTRODUCTION

The Carnation Creek Experimental Watershed Project started in 1970 with the initiation of pre-logging studies (Narver and Chamberlin 1976). Road construction began in January 1975 and logging started in the fall of 1975. Most of the road construction was completed by the end of the 1977-78 winter. Logging was completed in June 1981 (Fig. 2). A study on the effects of an aerial applied herbicide was started in September 1984.

March 1986 marked the end of Phase I of the study. At that time the level of field work was reduced and most of the field work on fish is now done by a contractor. The July population estimates and work on Pachena, Useless and Ritherdon creeks have been discontinued. A new study section in upper Carnation creek has been added to the project.

The basic rational for the study, the study sites (Fig. 2), adjacent study streams (Fig. 1), and methods used in fish studies have all been described in Andersen (1983). This report is one in a series on fish populations in Carnation Creek and other Barkley Sound streams (Andersen 1983, 1984, 1985). This report covers the period from January 1983 to December 1984.

RESULTS

ADULT STUDIES

Coho

The age compositions of adult coho for 1985 and 1986 are given in Table 1. Length distributions by sex are given in Table 3.

Time of entry into Carnation Creek continued to be strongly dependent on stream discharge (Table 2). Eighty-five percent of the coho had passed the counting fence by October 21 in 1985 and by November 19 in 1986.

The following table is a summary of adult coho escapements to Carnation Creek 1971-1986.

	Jack (.+)		Large male (.1+)		Female		
Year	Return	Mean fork length (cm)	Return	Mean fork length (cm)	Return	Mean fork length (cm)	Total large
1971[a]	62	35.0	108	55.7	81	61.0	189
1972	76	33.0	87	65.2	75	68.6	162
1973	43	33.8	85	62.8	71	66.8	164[b]
1974	75	35.6	88	58.1	70	66.9	159[c]
1975	54	33.4	89	65.4	69	65.9	158
1976	35	30.1	68	56.1	55	63.5	123
1977	53	34.7	76	57.3	51	65.2	127
1978	233	33.5	46	60.7	56	65.3	102
1979	114	33.2	136	58.2	176	64.0	312
1980	101	34.8	110	57.0	65	66.8	175[d]
1981	61	32.7	76	56.2	43[e]	64.4	119
1982	61	34.7	103	55.6	71	64.4	174
1983	83	34.7	52	54.7	51	61.2	103
1984	25	30.4	27	54.1	22[f]	63.9	49
1985	59	34.4	43	56.2	26	64.3	69
1986	27	33.6	64	55.2	55	63.5	119[g]
Mean	72.6		78.6		64.8		143.4

[a]The 1971 run was estimated using mark and recovery.

[b]Eight large coho not sexed but included in total.

[c]Includes 1 large unsampled coho.

[d]An estimated 5-10% should be added to this total to allow for fish observed going over the fence during a flood.

[e]5 of these fish were used for an egg take.

[f]One of these females was found dead and unspawned in the trap.

[g]An estimated 5% should be added to this total to allow for fish observed going over the fence during a flood on Nov. 23.

Chum

The estimates of chum salmon spawning escapement (above and below fence) in Carnation Creek were:

Year	Escapement	Year	Escapement
1970	2000[a]	1979	450
1971	1000	1980	3000
1972	1700	1981	2300
1973	4168	1982	1600
1974	3060	1983	1200
1975[b]	1200	1984	950
1976	1500	1985	2700
1977	1700	1986	275
1978	3300	Mean	1888

[a]Revised from an earlier estimate of 1200 fish.
[b]The 1975 estimate is very rought due to high stream discharge.

Weekly counts of chum salmon, by sex, passing Carnation Creek fence in 1985 and 1986 are in Table 4.

Length distribution by sex are given in Table 5. The mean fork lengths were:

Year	Male (cm)	Female (cm)
17 year average of yearly means (1970-1986)	72.7	70.1
1985	71.5	67.9
1986	72.1	67.7

The dominant age group of chum adults continued to be three winters in the ocean as determined by otoliths (Table 6).

Steelhead and Cutthroat

In 1985 four steelhead were caught at the fence:

April 11 ♀ 67 cm Age (_.2) going upstream
April 23 ♂ 68 cm Age (2.2) going upstream
April 29 ♀ 63 cm Age (2.2) kelt going downstream
Oct 14 ♀ 67 cm Age (3.2) kelt dead on fence

The 67 cm females may be the same fish.

On April 14, 1985, seven steelhead were observed in a pool 100 m downstream of the fence, on April 26, 1985 the fence was flooded out and fish could have passed upstream unobserved. On May 3, 1985 no steelhead were observed during a snorkle survey of the creek below the fence. On May 12, 1985 four steelhead kelts were observed upstream of the fence. At least one steelhead survived the summer in the creek and it was found dead on the fence in October.

No steelhead were caught or observed in 1986.

No adult sea-run cutthroat were caught in 1985 or 1986. On March 21, 1986 a sea-run cutthroat (~30 cm) was observed in 2600 m tributary.

As indicated above, high stream discharge can flood out the fence when it is fishing for juveniles (March to August) and allow adult fish to pass unobserved.

Other Salmon

In 1985 seven male and two female sockeye were passed through the fence and a further 40 sockeye were observed downstream of the fence. Only one sockeye was observed in 1986.

No pink salmon were seen in 1985 or 1986. No chinook were seen in 1985, one female chinook (~100 cm+) was observed in 1986.

JUVENILE STUDIES

The basic data on length, length-weight, condition factor, population, density and biomass for juvenile fish are in the appendices.

Downstream Migrants

Outmigrations of juvenile salmon in relation to date, maximum daily water temperature and mean daily stream discharge are presented in Figures 3 and 4. Total counts for 1985 and 1986 are summarized in Table 7.

Coho

A summary of juvenile coho outmigration by age:

			I+ ≥60 mm		II+			
Year	Fry run	I+ <60 mm run	Run	Mean fork Ln. (mm)	Run	Mean fork Ln. (mm)	Total fish ≥60 mm	50% point of smolt run
1971[a]	122774	62	1000	76.6	1415	93.3	2415	May 14
1972	25664	40	1305	83.3	574	108.0	1879	May 4
1973	19183	141	974	77.4	776	101.9	1750	May 8
1974	21600	184	1030	74.2	1444	99.2	2474	May 9
1975	31364	128	1119	75.2	874	94.6	1993	May 9
1976	24714	206	1788	72.0	1068	92.8	2856	May 10
1977	7877	103	1522	78.1	935	97.5	2457	May 4
1978	13972	27	3441	83.6	778	100.0	4619	May 2
1979	5285	19	2843	80.6	668	96.3	3511	Apr 30
1980	27654	21	3555	85.4	991	104.6	4546	Apr 30
1981	11303	49	3719	82.4	396	104.1	4115	May 5
1982	4108	1	2847	86.6	622	100.1	3469	May 6
1983	9216	3	3437	86.1	305	103.0	3742	Apr 24
1984	2937	10	2984	84.0	119	102.2	3103	May 6
1985	9631	1	1787	92.1	190	104.7	1977	May 3
1986	1227	1	2744	85.5	88	105.2	2832	Apr 28

[a]Temporary fence, run numbers are very rough.

The numbers of age I+ coho smolts in both 1985 and 1986 were the lowest of the post logging period with the number of 1985 age I+ smolts being at prelogging levels. The number of 1986 age II+ coho smolts was the lowest recorded in this study.

The coho smolt migration timing in 1985 and 1986 continued the post logging trend of being earlier than in the prelogging period (Table 8).

The mean length of age I+ coho smolts in 1985 was 10.7 mm larger than the 16 yr average of the yearly means (81.4 mm) and 5.5 mm larger than the previous high. Age II coho smolts in both 1985 and 1986 were larger than the 16-yr average of the yearly means (100.8 mm). The weekly mean lengths are shown in Figure 5.

In 1986 the coho fry run was the lowest recorded at 42% of the previous low and 8.5% of the 15-yr (1972-86) mean of 14382. The 50% point of the coho fry run (Table 8) in both 1985 and 1986 was 2 to 3 weeks later than in the previous 2 years and 4 to 10 days later than the mean 50% date of the post logging period. Mean lengths of coho fry in the downstream run are summarized in Table 9.

Chum

Chum fry outmigrations from above the fence:

15 year mean 1972-1986	34110
1985	7695
1986	2637

Timing of chum fry runs are in Table 8, mean lengths in Table 9.

Steelhead and Cutthroat

	Steelhead				Cutthroat		
	<100 mm	≥100 mm			<100 mm	≥100 mm	
Year	Run	Run	Mean length	50% point of run	Run	Run	Mean length
1971[a]	308	167	143.3	May 20	10	19	133.7
1972	39	59	153.2	Jun 9	-	4	155.8
1973	113	93	134.6	May 23	8	24	135.0
1974	179	78	144.5	May 22	7	48	144.9
1975	128	68	143.8	May 27	34	58	137.5
1976	301	113	133.9	May 24	16	78	129.3
1977	176	106	131.1	May 9	24	93	128.6
1978	7	103	139.0	May 10	7	60	122.6
1979	1	20	140.1	May 6	3	25	125.2
1980	10	51	161.9	May 9	6	60	141.7
1981	21	14	136.7	Apr 23	19	38	123.5
1982	17	36	134.6	May 10	8	6	152.3
1983	25	124	133.4	May 3	14	40	132.6
1984	5	27	145.0	Apr 21	14	40	120.9
1985	58	35	132.7	May 13	9	33	134.0
1986	14	28	137.0	Apr 18	8	13	116.5

[a]Temporary fence, run numbers very rough.

The 50% point of steelhead smolt outmigration in 1985 was the latest of the post logging period while the 1986 run was the earliest recorded in this study. The numbers and mean lengths of both steelhead and cutthroat smolts (≥100 mm) were within the range of previous years.

The age compositions and mean lengths of juvenile steelhead and cutthroat in the downstream migrations are given in Table 10.

Resident Fish

March 1986 marked the end of phase I of the Carnation Creek project. At this time work on the resident fish populations of Pachena, Useless and Ritherdon creeks was terminated, also the July population estimates in lower Carnation Creek were discontinued.

In 1986, a new area (Section X) was added for population estimates in upper Carnation Creek. This new section is located approximately 500 m downstream of section IX and is just upstream of the canyon.

The late summer fish populations and densities for the lowest 3070 m of Carnation Creek are given in Tables 11 and 12.

The following table summarizes the late summer population estimates for lower Carnation Creek 1970-1986.

	Coho		Rainbow				Cottus aleuticus
Year	0	I	0	I	II	III	
1970	14129	790	1685	694	392		
1971	11824	1286	3451	501	119	128	
1972	9252	702	1597	386	58		2292
1973	9071	1229	5117	229	101	9	4539
1974	12584	1114	3545	456	~76	10	4058
1975	11482	1333	2892	376	~85		2488
1976	12327	1232	2939	355	~80		1642
1977	10602	1236	344	232	258		1617
1978	10928	1089	136	94	68	9	3411
1979	13230	1546	-	39	-		1845
1980	20953	2142	269	16	24		1832
1981	5909	743	1774	116	8		2187
1982	7337	220	1063	346	47		1811
1983	9922	249	240	171	69		3776
1984	3005	139	1389	57	8		1576
1985	6825	-	843	120	8		783
1986	2916	98	554	~35	35		574

The 1986 population estimate for age 0 coho was the lowest recorded in this study. 1985 and 1986 continued the trend starting in 1982, of there being much lower numbers of age I coho. It was not possible to make an estimate of age I coho in 1985 due to very low numbers of age I coho in the catches. The number of rainbow trout continued to be at the low end of the range of previous years. The sculpin populations in both 1985 and 1986 were less than 50% of the previous low.

The following table sumamrizes late summer Carnation Creek juvenile coho density (fish/m^2) by study section and year.

	Age 0 fish/m^2 by section							Age I fish/m^2 by section						
	II	III	IV	V	VI	VIII	All	II	III	IV	V	VI	VIII	All
1970	.89	1.18			1.73	.98	1.15	.06	.06			.08	.02	.06
1971	1.14	.82	.44		.96	.99	.88	.16	.11	.05		.05	.05	.10
1972	.60	.59	1.01		1.01	.86	.80	.05	.09	.06		.03	.09	.06
1973	.61	.52	1.05	.44	.93	-	.73	.12	.10	.11	.05	.17	.04	.10
1974	.66	.75	1.27	1.00	1.30	.68	.92	.10	.06	.13	.08	.08	.02	.08
1975	.61	.38	.98	.86	1.00	.68	.75	.13	.05	.09	.05	.13	.03	.09
1976	.72	.58	.92	.88	.69	.47	.69	.09	.08	.08	.07	.07	.04	.07
1977	.24	.30	.44	1.18	.78	.30	.53	.10	.06	.09	.06	.04	.03	.06
1978	.45	.35	.74	.66	.60	.27	.50	.02	.04	.05	.10	.10	.02	.05
1979	.72	.60	1.14	.29	.51	.94	.74	.10	.12	.11	.10	.07	.04	.09
1980	.70	.98	1.97	1.24	1.15	1.58	1.26	.12	.19	.19	.10	.11	.13	.13
1981	.14	.43	.80	.38	.26	.30	.38	.02	.03	.09	.06	.03	.08	.05
1982	.36	.56	.72	.35	.57	.53	.51	.01	.03	.01	.01	0	.04	.02
1983	.51	.57	.67	.61	.54	.69	.59	.01	.02	.03	.03	~.01	.01	.015
1984	.23	.24	.31	.14	.19	.06	.20	0	.004	.003	.01	.06	.01	.01
1985	.35	.65	.36	.48	.76	.13	.40	0	0	~.005	.003	0	0	~.002
1986	.35	.27	.36	.24	.19	0	.26	.005	.03	.006	0	.01	0	.009

Note: The numbers in the All column are not means but derived from areas and catches in all section combined for population estimates.

Late summer densities of resident fish in 1985 and 1986 for Carnation Creek and other streams are summarized in Table 13. In upper Carnation Creek the density of cutthroat trout fry was the highest of all years in 1986 and among the lowest in 1985. Tributary "C" density of cutthroat fry was among highest in 1985, age I + II cutthroat densities were among the lowest for both 1985 and 1986. Fish densities in Useless Creek were within the range of previous years. South Panchena coho fry density was highest of all years studies. Cutthroat trout densities in Ritherdon Creek were within the range of previous years.

Late summer biomasses (g/m^2) of resident fish in 1985 and 1986 are summarized for all streams in Table 14.

A summary of late summer mean lengths (mm) for all streams and all salmonid species is given in Table 15.

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Table 1. Age composition of adult coho salmon run in Carnation Creek 1985 and 1986.

		Total age						Fresh water			Ocean		
		1.+	2.+	Total	1.1+	2.1+	Total	1.	2.	Total	.+	.1+	Total
1985													
♂	n	53	4	57	30	8	38	83	12	95	59	43	102
	%	93.0	7.0		78.9	21.1		87.4	12.6		57.8	42.2	
♀	n	0	0	0	22	3	25	22	3	25	0	26	26
	%	-	-	-	88.0	12.0		88.0	12.0			100.0	
Total	n	53	4	57	52	11	63	105	15	120	59	69	128
	%	93.0	7.0		82.5	17.5		87.5	12.5		46.1	53.9	
1986													
♂	n	22	2	24	54	7	61	76	9	85	27	64	91
	%	91.7	8.3		88.5	11.5		89.4	10.6		29.7	70.3	
♀	n	0	0	0	46	8	54	46	8	54	0	55	55
	%	-	-	-	85.2	14.8		85.2	14.8			100.0	
Total	n	22	2	24	100	15	115	122	17	139	27	119	146
	%	91.7	8.3		87.0	13.0		87.8	12.2		18.5	81.5	

Note: Differences between total freshwater and ocean numbers is due to some scales being unreadable in the freshwater zone.

Table 2. Weekly fence count of coho salmon into Carnation Creek by ocean age and sex 1985 and 1986.

1985						1986					
				Total						Total	
Week	♀ n	♂(.1+) n	Jack n	n	Accum. %	Week	♀ n	♂(.1+) n	Jack n	n	Accum. %
Sept						Sept					
14 + 15	0	1	7	8	6.2						
						23-27	4	11	9	24	16.4
						28-Oct 4	0	0	1	1	17.1
Oct						Oct					
11 + 12	3	8	13	24	25.0	5-11	0	0	0	0	
13-19	11	22	25	58	70.3	12-18	0	0	0	0	
20-26	9	9	11	29	93.0	19-25	0	0	0	0	
27-Nov 2	1	2	3	6	97.7	26-Nov 1	22	34	12	68	63.7
Nov						Nov					
3-9	1	1	0	2	99.2	2-8	3	0	0	3	65.8
						9-15	1	0	0	1	66.4
						16-22	16	15	4	35	90.4
						23-29	2	3	1	6	94.5
Dec						Dec					
18	1	0	0	1	100.0	N30-6	6	1	0	7	99.3
						7-13	0	0	0	0	
						14-20	1	0	0	1	100.0
Total	26	43	59	128			55	64	27	146	

Notes: On Nov. 19, 1986 one injured unspawned ♀ (54 cm age 1.1) was released upstream, successful spawning was doubtful.

On Nov. 23, 1986 several large coho were observed going over the fence during a flood at a time of high tide. An estimated 5% should be added to the large adult run to allow for these unsampled fish.

Table 3. Length frequency and mean length of adult coho salmon in Carnation Creek by ocean age and sex, 1985 and 1986.

Fork length (cm)	Jacks (.+) 1985	Jacks (.+) 1986	Large males (.1+) 1985	Large males (.1+) 1986	Females (.1+) 1985	Females (.1+) 1986	Fork length (cm)	Large males (.1+) 1985	Large males (.1+) 1986	Females (.1+) 1985	Females (.1+) 1986
25							51	3	3		
26		1					52	2	2		1
27	2	1					53	4	3	1	
28							54		4	1	3
29	1	3					55		2	1	3
30	1	5					56	3	2		
31	3	2					57				2
32	10	1					58	3	2	1	2
33	7						59	1	1	2	2
34	6	3					60	4			4
35	7	1		1			61	3	4	2	2
36	5	2					62	1	1	2	1
37	8	3					63	1	2	3	2
38	3	1					64		1		4
39	1	1		1			65		2	3	3
40	3	1					66	1	2		1
41	1	1	1				67	2	4		1
42			2	1			68		1	1	3
43				3			69		2	3	6
44				2		1	70		1	3	2
45				2			71	2		1	3
46		1		1			72	1	1		2
47			3	3			73				2
48			3	2			74			1	1
49			1	2		1	75	1		1	1
50			1	5		1	76				
							77		1		
							80				1
n	58	27						43	64	26	55
$\bar{x}$(cm)	34.4	33.6						56.2	55.2	64.35	63.5

Note: On Oct. 16, 1985 one jack coho was lost unsptream without being measured.

Table 4. Weekly count of adult chum salmon, by sex, passing Carnation Creek fence in 1985 and 1986.

1985					1986				
			Total					Total	
	♀	♂				♀	♂		
Week	n	n	n	Accum %	Week	n	n	n	Accum %
Oct					Oct				
11	1	2	3	4.0					
13-19	2	6	8	14.7					
20-26	14	21	35	61.3					
27-Nov 2	2	4	6	69.3	26-Nov 1	26	35	61	70.9
Nov					Nov				
3-9	0	2	2	72.0	2-8		2	2	73.3
10-16	2	19	21	100.0	9-15	1	1	2	75.6
					16-22	6	15	21	100.0
Total	21	54	75			33	53	86	

Notes:

1. On Oct. 22, 1985 two females (67 + 65 cm) had partially spawned before entering trap. Released upstream.
2. On Oct. 26, 1985 one female (63 cm) had partially spawned before entering trap, estimated to have 75% of eggs left when released upstream.
3. On Oct. 28, 1985 one female (61.5 cm) was retained for egg take.
4. In 1986, 12 of the females were released upstream in a partially spawned out condition (62, 63, 65, 3 at 69, 70, 71, 3 at 72, 74 cm).

All of the above are included in the weekly fence counts.
Some of the adult chum passing the fence were caught in a lift net below the fence and released upstream.

Table 5. Length frequency (fork length) of adult chum salmon by sex in Carnation Creek, 1985 and 1986.

Fork length (cm)	Males		Females	
	1985	1986	1985	1986
55		1		
56				
57				1
58	1			
59				1
60			3	
61	1	2	2	2
62	3		6	7
63	1	2	5	5
64	1	1	6	6
65	4	5	6	3
66	5	2	8	4
67	5	3	7	7
68	9	9	7	11
69	9	6	12	16
70	7	12	12	5
71	5	7	7	9
72	10	3	10	9
73	6	5	3	
74	3	11	2	4
75	5	7	3	
76	6	9		
77	7	5		
78	2	5		1
79	3	1	1	
80	1	2		
81	2	2		
82	1	1		
83	1	1		
84	2			
89		1		
$\bar{n}$	100	103	100	91
$\bar{x}$(cm)	71.53	72.06	67.92	67.71

Table 6. Fork length and age composition (otoliths) of chum salmon in Carnation Creek, 1985 and 1986.

Fork length (cm)	Males						Females					
	0.2		0.3		0.4		0.2		0.3		0.4	
	1985	1986	1985	1986	1985	1986	1985	1986	1985	1986	1985	1986
57								1				
58			1									
59												
60		1					3	1				
61	1	1					2	3				
62	2	1	1				6	3		2		
63	1						3	2	2	2		
64	1	1					3		3	2		
65	2		2	1			1	1	4	1		
66	3		2	1			3	1	5	3		
67	2		3	2			4		3	7		
68	1	1	8	4			1		6	9		
69	4	1	5	3			1	2	11	9		
70			7	5					10	4		
71	2		3	5					7	3		
72	2	1	8						10	5		1
73			6	3					3	1		
74			3	5					2	2		
75			5	4					3	1		
76			6	4								
77			6	3								
78			2	2								
79			4	1					1			
80					1	1						
81			2			2						
82			1			1						
83			1	1								
84					2							
85												
86				1								
n	21	7	76	45	3	4	27	14	70	51	0	1
$\bar{x}$ (cm)	66.9	65.1	72.4	72.8	82.7	81.0	63.8	62.9	69.5	68.5	-	72.0
%	21.0	12.5	76.0	80.4	3.0	7.1	27.8	21.2	72.2	77.3	-	1.5

Table 7. Summary of downstream counts of cottids and juvenile salmonids at the Carnation Creek counting fence, 1985 and 1986.

Species	Age	1985	1986
Chum	fry	7695	2637
Coho	fry	9631	1227
	I+(<60 mm)	1	1
	I+(≥60 mm)	1787	2744
	II+	190	88
	Total I+(≥60 mm)II+	1977	2832
Steelhead	<100 mm	58	14
	≥100 mm	35	28
Cutthroat	<100 mm	9	8
	≥100 mm	33	13
Cottus asper		113	149
Cottus aleuticus		18	44
Sampling period		March 1-June 19	March 9-July 28

Table 8. Dates when 25, 50 and 75% of the downstream migration of coho, chum, steelhead occurred in Carnation Creek, 1985 and 1986.

Species	Accum. %	1985	1986
Coho smolts	25	April 27	April 11
	50	May 3	April 28
	75	May 8	May 7
Steelhead (≥100 mm)	25	April 24	March 29
	50	May 13	April 18
	75	May 16	May 16
Coho fry	25	April 1	April 9
	50	April 13	April 19
	75	April 22	April 25
Chum fry	25	April 21	April 13
	50	April 24	April 16
	75	May 2	April 19

Table 9. Mean length, range, and standard deviation of coho and chum fry in the 1985 and 1986 Carnation Creek outmigrations.

	Coho fry				Chum fry			
Date	$\bar{x}$ (mm)	n	s	Range (mm)	$\bar{x}$ (mm)	n	s	Range (mm)
1985								
March 29	36.15	65	1.349	33-38				
April 02	36.59	59	0.768	35-39				
10	37.85	84	1.256	33-40				
14					39.20	20	0.616	38-40
18	36.04	50	1.906	33-40	40.10	50	1.074	37-43
24	36.00	57	1.626	32-39	40.61	59	1.246	37-43
28	36.00	39	1.762	30-39	39.97	65	1.610	35-44
May 02					38.96	50	2.531	33-44
03	35.79	57	1.688	30-39				
07	35.12	59	2.492	31-44	40.00	34	0.921	38-42
19					40.21	19	0.713	39-41
26					39.78	51	1.006	38-42
30					39.98	53	0.693	38-49
1986								
March 22	37.32	37	1.226	35-40				
April 03	36.01	84	1.418	34-40				
11	35.60	100	2.113	31-39	42.03	60	0.843	39-44
12					41.50	50	0.735	40-43
22					41.78	32	1.008	39-44
23					41.57	44	0.925	39-43
25	35.75	56	1.338	32-38				
May 01	38.48	25	2.502	35-46				
10					39.46	35	0.611	38-41
June 05	49.09	32	3.905	42-62				
17	50.31	36	5.025	39-60				

Table 10. Age composition and mean lengths of rainbow and cutthroat trout in the downstream migrations in Carnation Creek 1985 and 1986.

	Rainbow				Cutthroat			
Age	n	$\bar{x}$ (mm)	S.D.	Range (mm)	n	$\bar{x}$ (mm)	S.D.	Range (mm)
1985								
I	67	90.4	9.63	66-113	11	89.0	18.12	51-108
II(all)	17	126.8	24.06	88-177	25	127.8	14.41	99-162
II(≥100 mm)	14	134.3	19.11	100-177	24	129.0	13.37	100-162
III	6	189.3	21.29	176-232	4	193.7	55.84	159-277
Total(≥100 mm)	33	132.7	33.82	100-232	32	134.0	32.07	100-277
1986								
I	18	93.4	12.07	72-114	12	96.6	14.05	78-118
II(all)	17	133.5	15.24	112-161	9	117.6	11.25	104-142
II(≥100 mm)	17	133.5	15.24	112-161	9	117.6	11.25	104-142
III	4	187.2	32.99	167-236	-	-	-	-
Total(≥100 mm)	26	137.0	29.26	103-236	13	116.5	9.47	104-142

Table 11. Late summer resident population estimates on lower Carnation Creek (3070 m) 1985 and 1986.

	1985				1986			
			95% CI				95% CI	
Species	Age	n	Lower	Upper	Age	n	Lower	Upper
Coho	0	6825	6757	6892	0	2916	2880	2951
	I	-			I	98	91	105
					Total	3014		
Rainbow	0	843	805	880	0	554	519	596
	I	120	15	226	I	~35		
	II	8	8	8	II	35	21	49
	Total	971			Total	624		
Cutthroat	0	23	23	23	0	175	168	189
	I	60	15	105	I	56	56	56
	II	8	8	8	II	28	28	28
	Total	91			Total	259		
Cottus aleuticus	All	783	662	910	All	574	483	659

Table 12. Late summer fish density (fish/m^2) by study section and species in lowest 3070 m of Carnation Creek 1985 and 1986.

Species	Age	II	III	IV	V	VI	VIII	Combined[a]
1985								
Coho	0	.35	.65	.36	.48	.76	.13	.40
	I	0	0	~.005	.003	0	0	~.002
Rainbow	0							.05
	I							.007
	II							.0004
Cutthroat	0							.001
	I							.004
	II							.0004
C. asper	All	~.03						
C. aleuticus	All	.06	.08	.08	.07	.03	.007	.05
1986								
Coho	0	.35	.27	.36	.24	.19	0	.26
	I	.005	.03	.006	0	.01	0	.009
Rainbow	0	.02	.11	.08	.06	~.01	0	.05
	I							~.003
	II							.003
Cutthroat	0							.02
	I							.005
	II							.002
C. asper	All	.03						
C. aleuticus	All	.05	.06	.06	.13	~.03	.006	.05

[a]Not a mean but derived from areas and catches in all sections combined for population estimates.

Table 13. Late summer fish density (fish/m^2) by species for all streams, 1985 and 1986.

Species	Age	Lower Carnation	Upper Carnation		Trib "C"	Useless	Ritherdon	South Pachena
1985								
Coho	0	.40				.09		1.53
	I	~.002				-		.01
Rainbow	0	.05						.14
	I	.007						.01
	II	.0004						-
			IX					
Cutthroat	0	.001	.08		.64	~.06	.49	-
	I	.004	.14		.06	.04	.12	~.01
	II	.0004	.02		~.02	.02	.01	~.01
	III				.01	~.01		-
C. asper	All							.11
C. aleuticus	All	.05				.27		.28
1986								
Coho	0	.26						
	I	.009						
Rainbow	0	.05						
	I	~.003						
	II	.003						
			IX	X				
Cutthroat	0	.02	.44	.23	.39			
	I	.005	.12	.18	.09			
	II	.002	.07	.07	.02			
	III			.004				
C. asper	All							
C. aleuticus	All	.05						

Table 14. Late summer biomass per unit area (gm/m^2) by species for all streams studied in 1985 and 1986.

Species	Age	Lower Carnation	Upper Carnation	Trib "C"	Useless	Ritherdon	South Pachena
1985							
Coho	0	.85			.19		1.68
	I	~.01			-		.10
Rainbow	0	.05					.10
	I	.07					.09
	II	.01					
			IX				
Cutthroat	0	.003	.12	.71	~.04	.39	-
	I	.04	1.10	.52	.26	1.24	-
	II	.02	.41	~.56	.35	.38	-
	III			.45	~.68		-
C. asper	All						.91
C. aleuticus	All	.30			1.12		1.19
1986							
Coho	0	.96					
	I	.08					
Rainbow	0	.09					
	I	~.04					
	II	.08					
			IX	X			
Cutthroat	0	.05	.39	.28	.59		
	I	.07	.98	1.57	1.01		
	II	.08	1.49	1.38	.55		
	III			.21			
C. asper	All						
C. aleuticus	All	.38					

Table 15. Late summer mean length (mm) for salmonids in all streams studied in 1985 and 1986.

Species	Age	Lower Carnation	Upper Carnation	Trib "C"	Useless	Ritherdon	South Pachena
1985							
Coho	0	57.4			56.7		45.9
	I	80.2(2)					92.3(3)
Rainbow	0	46.6					42.6
	I	101.8					95.7(3)
	II	141.0(1)					
			IX				
Cutthroat	0	65.0(3)	49.9	47.7	41.2(6)	43.9	
	I	105.1(7)	91.2	97.7(6)	88.6(5)	101.2	116.0(2)
	II	163.0(1)	134.6(3)	144.0(2)	118.3(3)	157.0(2)	141.0(1)
	III			165.0(1)	170.5(2)		
1986							
Coho	0	68.8					
	I	93.6					
Rainbow	0	58.1					
	I	103.2(4)					
	II	129.6(5)					
			Upper Carnation		Trib "C"		
			IX	X			
Cutthroat	0	68.0	43.3	48.6	53.5		
	I	104.6	94.0	95.2	100.6		
	II	136.2(4)	125.5	125.8	132.0(2)		
	III			164.0(1)			

Note: If the number of fish in a sample is small that number is in brackets after the mean length.

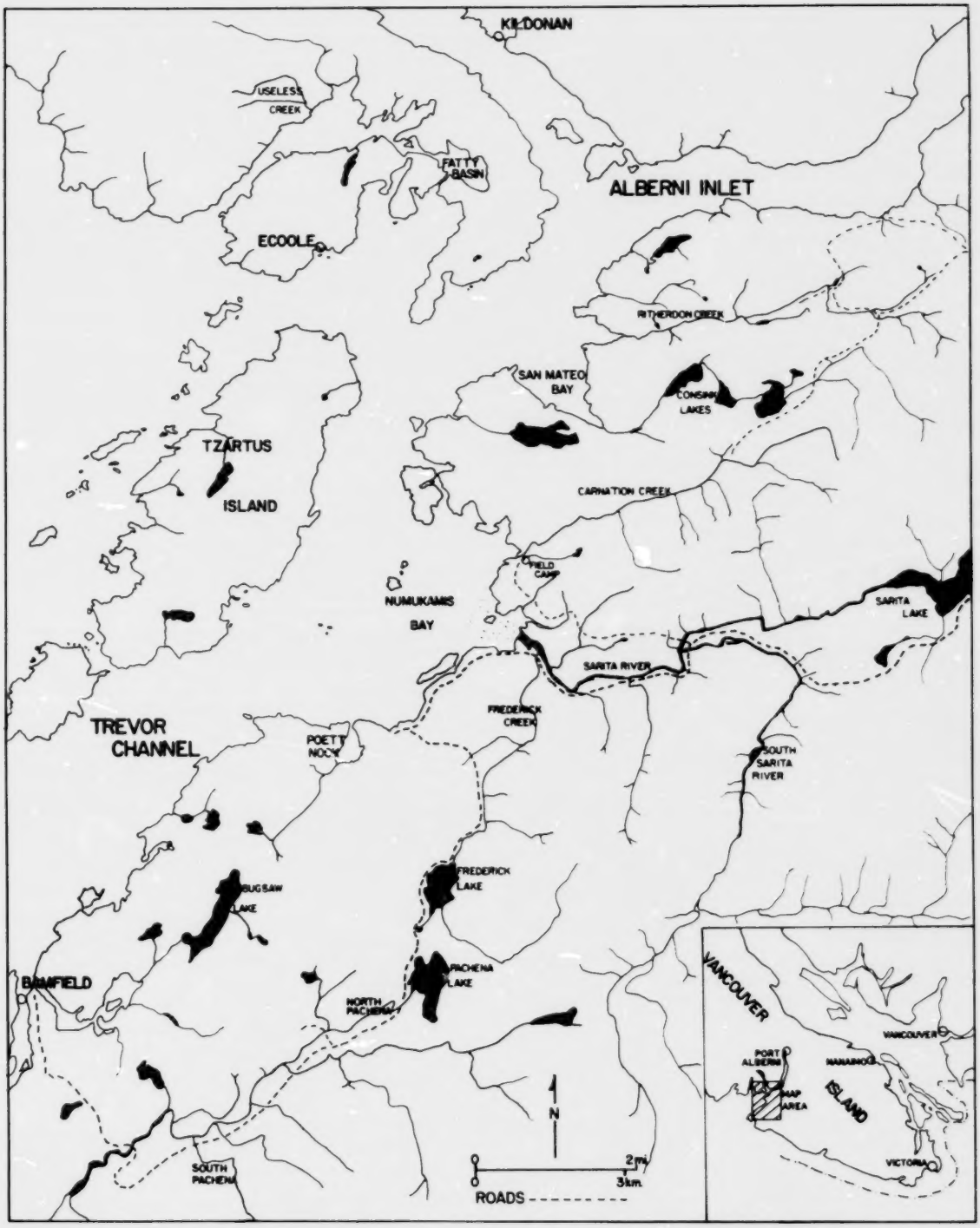

Fig. 1. Map showing location of study streams in the Barkley Sound area. Only main roads shown.

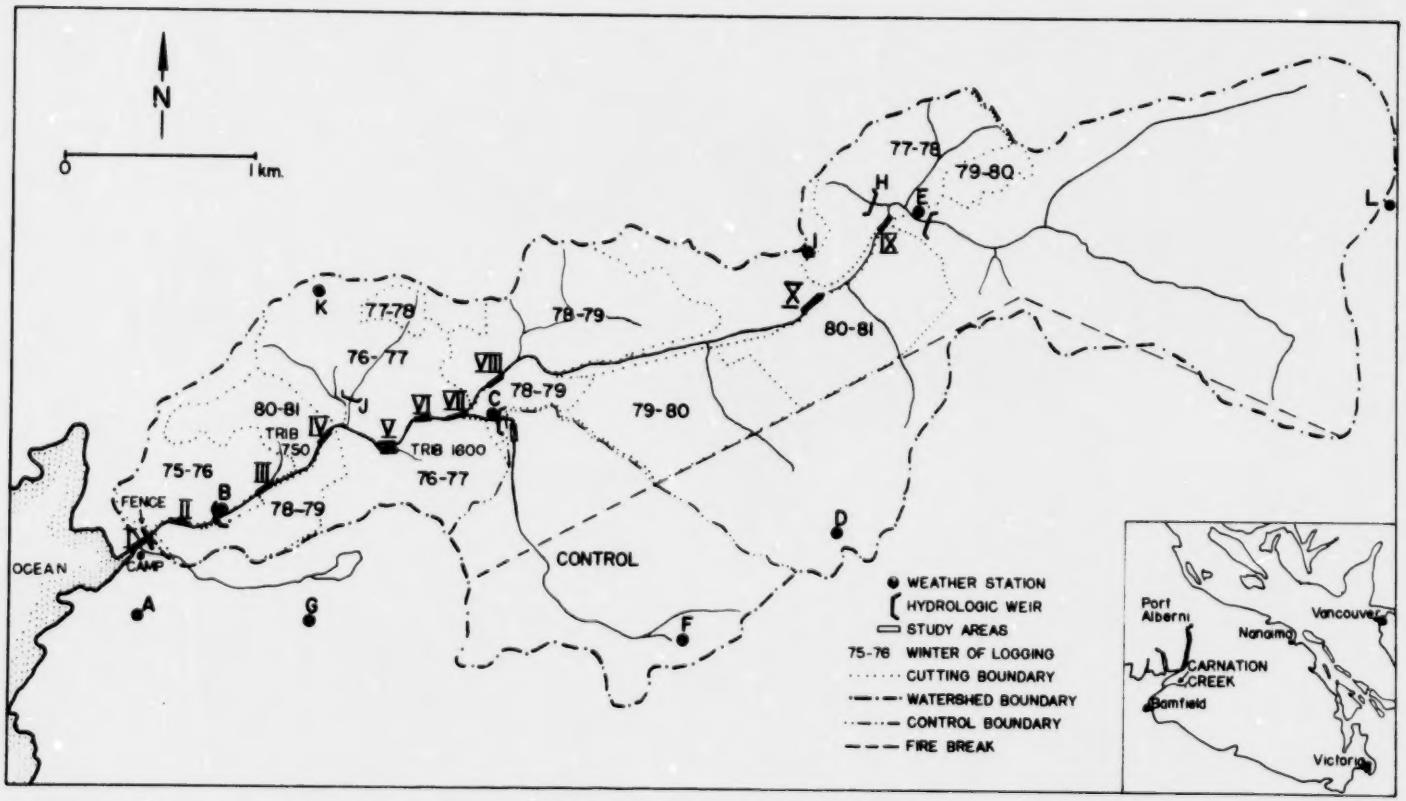

Fig. 2. Carnation Creek Watershed showing the main channel and tributaries; location of hydrometeorological stations, fish counting fence, stream study sections and clearcuts.

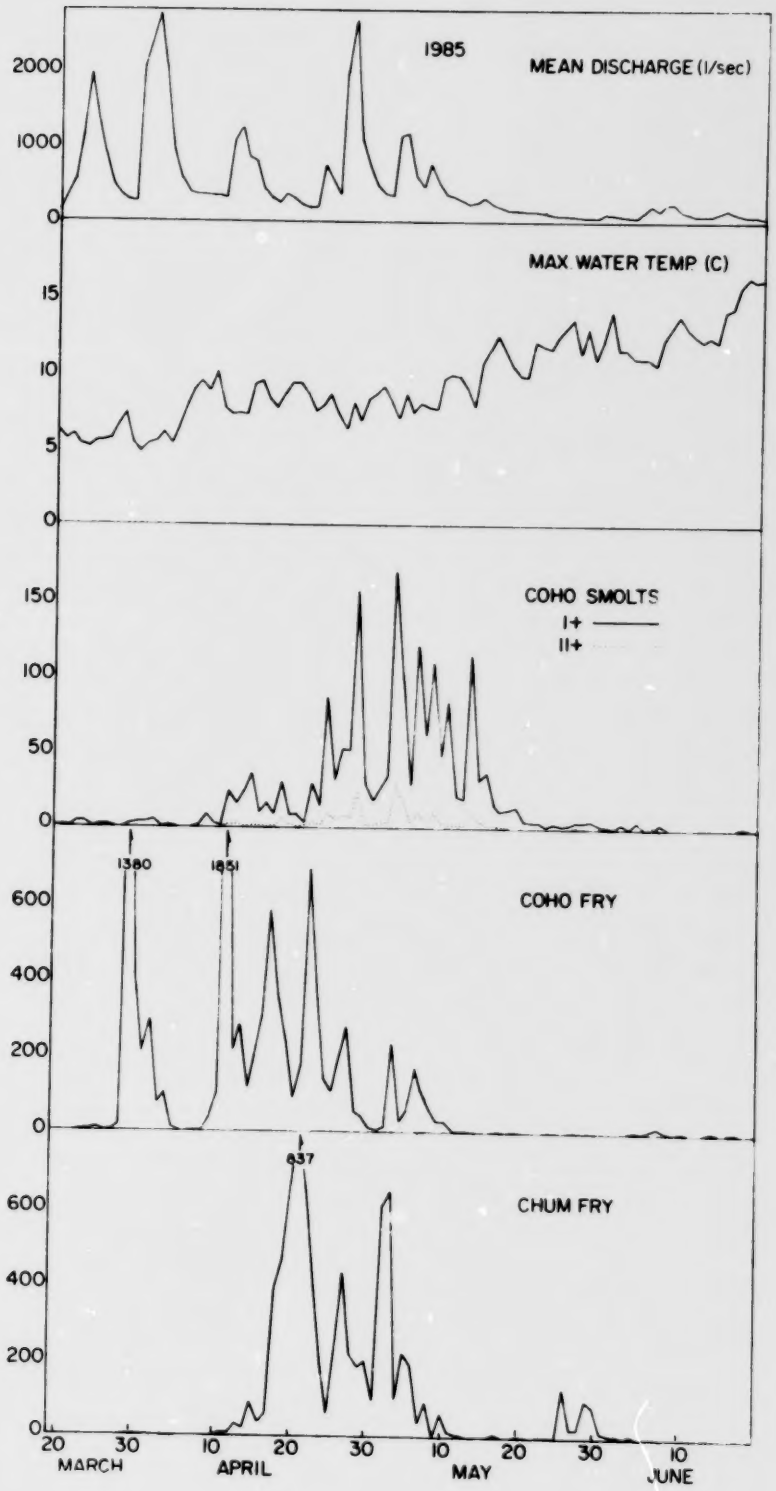

Fig. 3. Outmigration of juvenile salmon from Carnation Creek in relation to date, water temperature and discharge, 1985.

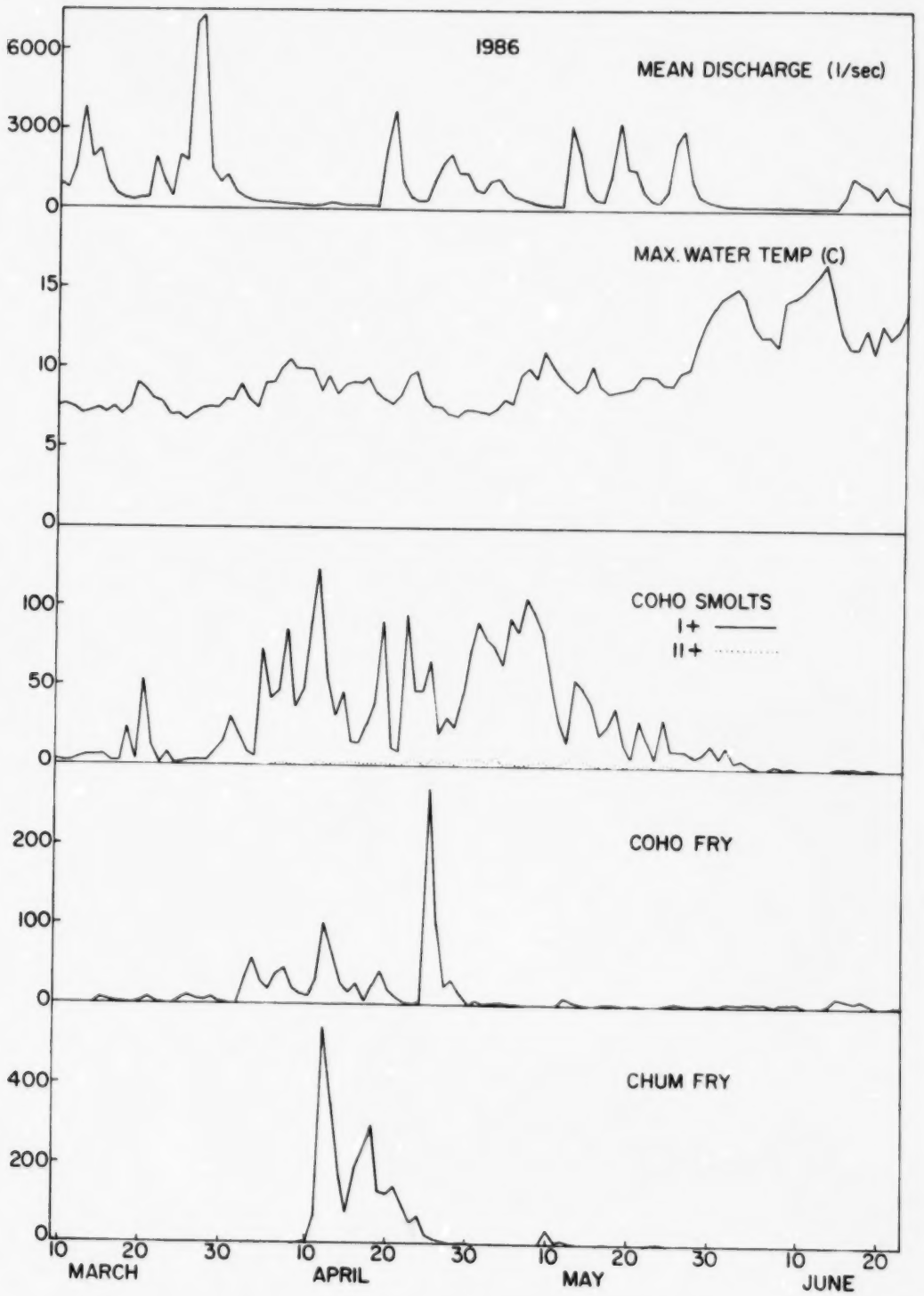

Fig. 4. Outmigration of juvenile salmon from Carnation Creek in relation to date, water temperature and discharge, 1986.

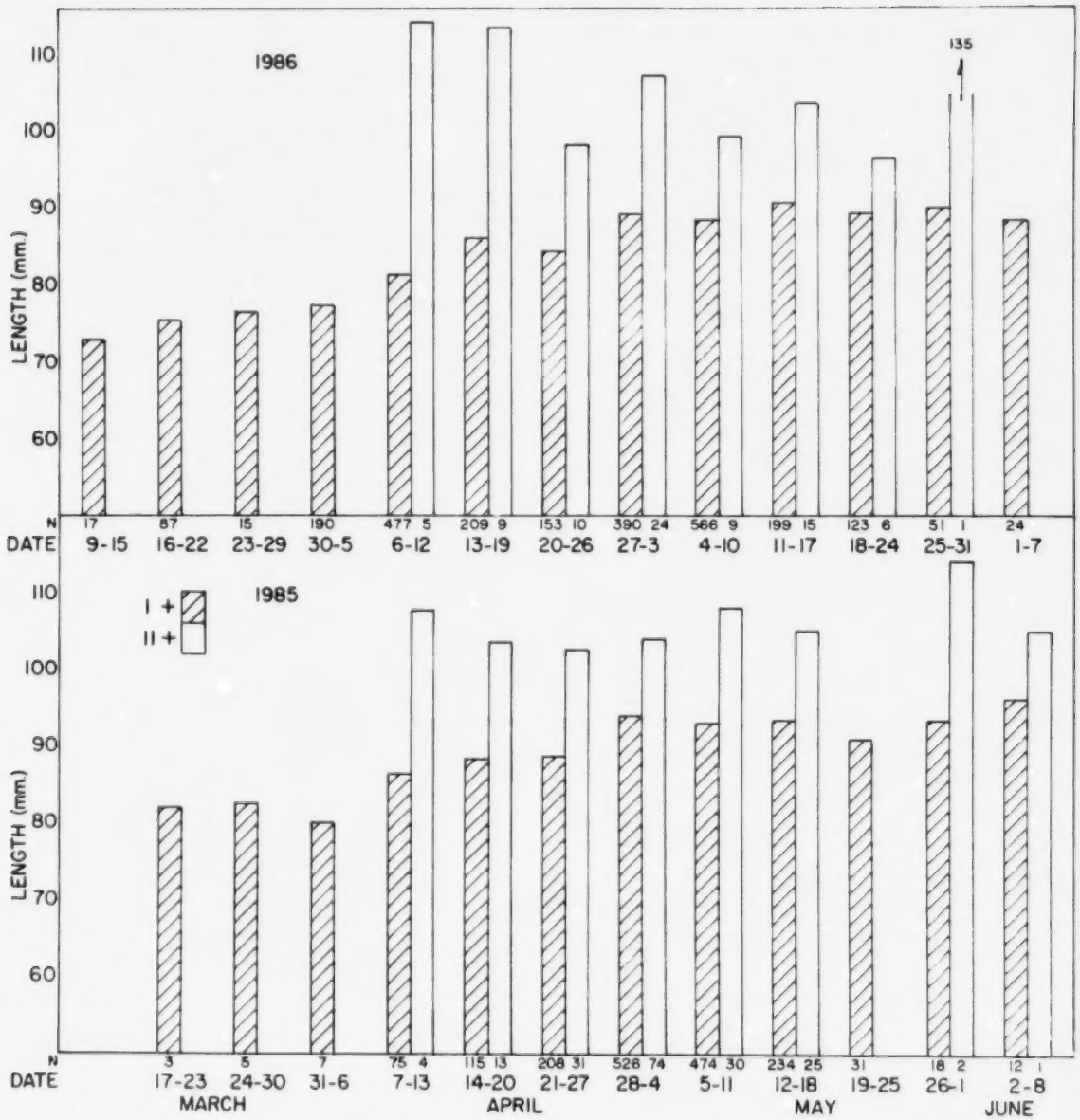

Fig. 5. Weekly mean lengths of age 1 and II coho smolts (> 59 mm) leaving Carnation Creek in 1985 and 1986.

APPENDIX I. CARNATION CREEK COHO.

SEC	AGE	AREA (SQ.M) WET	AREA (SQ.M) RIF	SEC LEN (M)	C1	C2	POP N	VAR N	95 % CONF LIM LOW	95 % CONF LIM UP	P	MEAN WT (GM)	MEAN LEN (MM)	DENSITY FISH/SQ.M WET	DENSITY FISH/SQ.M RIF	DENSITY FISH/SQ.M POOL	WETTED TOT WT (GM)	GM./SQ.M WET	GM./SQ.M RIF	GM./SQ.M POOL
MAY 27-29/85																				
II	0	401	61	70	156	33	198	21.9	188	207	0.79	0.87	43.1	0.49	3.24	0.58	172.1	0.43	2.82	0.51
	I				0	2						7.74	89.5							
III	0	299	61	55	197	23	223	4.9	219	227	0.88	0.88	43.5	0.75	3.66	0.94	196.3	0.66	3.22	0.82
IV	0	376	84	54	309	53	373	22.6	363	382	0.83	0.78	41.8	0.99	4.44	1.28	290.9	0.77	3.46	1.00
	I				1	1						6.30	82.3							
V	0	305	81	69	168	42	224	41.5	211	237	0.75	0.78	41.6	0.73	2.77	1.00	174.7	0.57	2.16	0.78
	I				2	0	2	0.0	2	2	1.00	6.75	85.0	0.01	0.02	0.01	13.5	0.04	0.17	0.06
VI	0	243	50	53	260	53	327	32.4	315	338	0.80	0.67	40.5	1.34	6.53	1.69	218.8	0.90	4.38	1.13
VIII	0	466	154	116	265	77	374	114.0	352	395	0.71	1.39	43.5	0.80	2.43	1.20	519.2	1.11	3.37	1.66
	I				1	0	1	0.0	1	1	1.00	9.40	96.0	0.00	0.01	0.00	9.0	0.02	0.06	0.03
	II				1	0	1	0.0	1	1	1.00	11.10	105.0	0.00	0.01	0.00	11.1	0.02	0.07	0.04
ALL	0	2090	491	417	1355	281	1710	178.3	1683	1736	0.79	0.91	42.2	0.82	3.48	1.07	1556.2	0.74	3.17	0.97
	I				4	3	16	1008.0	-47	79	0.25	6.80	84.8	0.01	0.03	0.01	108.8	0.05	0.22	0.07
	II				1	0	1	0.0	1	1	1.00	11.10	105.0	0.00	0.00	0.00	11.1	0.01	0.02	0.01
JULY 22-25/85																				
II	0	224	8	70	251	6	257	0.2	256	258	0.98	1.97	56.4	1.15	32.14	1.19	506.6	2.26	63.32	2.35
	I				1	0	1	0.0	1	1	1.00	5.70	81.0	0.00	0.13	0.00	5.7	0.03	0.71	0.03
III	0	291	36	56	252	36	294	10.9	287	301	0.86	1.96	56.1	1.01	8.17	1.15	576.2	1.98	16.01	2.26
IV	0	227	4	52	320	36	361	7.3	355	366	0.89	1.45	50.1	1.59	90.14	1.62	522.8	2.30	130.70	2.34
	I				4	1	5	1.0	3	7	0.75	6.75	85.0	0.02	1.33	0.02	36.0	0.16	9.00	0.16
V	0	259	39	69	233	23	259	3.8	255	262	0.90	1.79	53.9	1.00	6.63	1.18	462.7	1.79	11.87	2.10
	I				0	1						9.70	99.0							
VI	0	179	17	51	297	21	320	2.1	317	323	0.93	1.53	51.2	1.79	18.80	1.97	489.0	2.73	28.76	3.02
VIII	0	109	1	113	126	29	164	23.4	154	173	0.77	2.14	57.5	1.50	164.0	1.52	350.3	3.21	350.25	3.24
ALL	0	1289	105	411	1479	151	1647	26.1	1637	1657	0.90	1.76	53.7	1.28	15.69	1.39	2893.6	2.24	27.56	2.44
	I				5	2	8	8.6	2	14	0.60	9.63	98.7	0.01	0.08	0.01	80.2	0.06	0.76	0.07

APPENDIX I. CARNATION CREEK COHO.

SEC	AGE	AREA (SQ.M) WET	AREA (SQ.M) RIF	SEC LEN (M)	C1	C2	POP N	VAR N	95 % CONF LIM LOW	95 % CONF LIM UP	P	MEAN WT (GM)	MEAN LEN (MM)	DENSITY FISH/SQ.M WET	DENSITY FISH/SQ.M RIF	DENSITY FISH/SQ.M POOL	WETTED TOT WT (GM)	GM./SQ.M WET	GM./SQ.M RIF	GM./SQ.M POOL
SEPT 16-19/85																				
II	0	378	43	69	124	9	134	0.9	132	136	0.93	2.30	58.9	0.35	3.11	0.40	307.5	0.81	7.15	0.92
III	0	313	70	53	185	17	204	2.5	201	207	0.91	2.66	61.2	0.65	2.91	0.84	541.9	1.73	7.74	2.23
IV	0	392	81	54	116	20	140	8.6	134	146	0.83	1.67	53.6	0.36	1.73	0.45	234.1	0.60	2.89	0.75
	I				0	1						5.45	80.0							
V	0	331	99	68	142	15	159	2.7	155	162	0.89	1.92	56.4	0.48	1.60	0.68	304.8	0.92	3.08	1.31
	I				1	0	1	0.0	1	1	1.00	11.90	103.0	0.00	0.01	0.00	11.9	0.04	0.12	0.05
VI	0	256	68	52	171	20	194	4.3	190	198	0.88	1.75	54.9	0.76	2.85	1.03	338.9	1.32	4.98	1.80
VIII	0	584	272	112	64	12	79	6.1	74	84	0.81	2.41	60.1	0.13	0.29	0.25	189.8	0.33	0.70	0.61
ALL	0	2254	633	408	802	93	907	19.7	898	916	0.88	2.11	57.4	0.40	1.43	0.56	1914.9	0.85	3.03	1.18
	I				1	1						5.50	80.2							
JUNE 3-5/86																				
II	0	528	63	85	106	9	116	1.2	114	118	0.92	1.20	48.4	0.22	1.84	0.25	138.4	0.26	2.20	0.30
III	0	326	61	54	42	9	53	6.1	48	58	0.79	1.25	48.6	0.16	0.88	0.20	67.1	0.21	1.10	0.25
	I				9	0	9	0.0	9	9	1.00	6.09	81.0	0.03	0.15	0.03	54.8	0.17	0.90	0.21
IV	0	401	90	52	158	25	188	9.1	182	194	0.84	1.20	48.4	0.47	2.09	0.60	225.1	0.56	2.50	0.72
	I				3	0	3	0.0	3	3	1.00	5.05	72.3	0.01	0.03	0.01	15.2	0.04	0.17	0.05
V	0	256	115	66	13	3	17	2.4	14	20	0.77	1.35	48.4	0.07	0.15	0.12	22.8	0.09	0.20	0.16
	I				2	0	2	0.0	2	2	1.00	4.91	69.5	0.01	0.02	0.01	9.8	0.04	0.09	0.07
VI	0	274	91	63	1	2						1.78	51.7							
	I				1	0	1	0.0	1	1	1.00	5.52	72.0	0.00	0.01	0.01	5.5	0.02	0.06	0.03
VIII	0	633	118	113	1	0	1	0.0	1	1	1.00	1.85	51.0	0.00	0.01	0.00	1.9	0.00	0.02	0.00
ALL	0	2418	538	433	321	48	377	15.8	369	385	0.85	1.22	48.5	0.16	0.70	0.20	459.3	0.19	0.85	0.24
	I				15	0	15	0.0	15	15	1.00	5.68	77.1	0.01	0.03	0.01	85.3	0.04	0.16	0.05

APPENDIX I. CARNATION CREEK COHO.

SEC	AGE	AREA (SQ.M) WET	AREA (SQ.M) RIF	SEC LEN (M)	C1	C2	POP N	VAR N	95 % CONF LIM LOW	95 % CONF LIM UP	P	MEAN WT (GM)	MEAN LEN (MM)	DENSITY FISH/SQ.M WET	DENSITY FISH/SQ.M RIF	DENSITY FISH/SQ.M POOL	WETTED TOT WT (GM)	GM./SQ.M WET	GM./SQ.M RIF	GM./SQ.M POOL
SEPT. 15-17/86																				
II	0	409	12	80	131	11	143	1.4	141	145	0.92	3.52	67.9	0.35	11.92	0.36	503.0	1.23	41.91	1.27
	I				2	0	2	0.0	2	2	1.00	6.50	83.5	0.00	0.17	0.01	13.0	0.03	1.08	0.03
III	0	305	17	54	76	6	83	0.7	81	84	0.92	3.97	72.1	0.27	4.85	0.29	327.7	1.07	19.27	1.14
	I				7	1	8	0.3	7	9	0.86	10.41	96.9	0.03	0.48	0.03	85.0	0.28	5.00	0.30
IV	0	314	53	53	107	6	113	0.4	112	115	0.94	2.99	64.1	0.36	2.14	0.43	338.8	1.08	6.39	1.30
	I				2	0	2	0.0	2	2	1.00	8.16	90.0	0.01	0.04	0.01	16.3	0.05	0.31	0.06
V	0	195	58	71	33	10	47	16.7	39	56	0.70	3.84	70.3	0.24	0.82	0.35	181.9	0.93	3.14	1.33
VI	0	172	48	57	29	3	32	0.5	31	34	0.90	5.57	78.8	0.19	0.67	0.26	180.1	1.05	3.75	1.45
	I				2	0	2	0.0	2	2	1.00	10.41	94.0	0.01	0.04	0.02	20.8	0.12	0.43	0.17
VIII	0	181	4	123	0	0	0	0.0												
ALL	0	1576	192	438	376	36	416	5.6	411	421	0.90	3.66	68.8	0.26	2.17	0.30	1520.1	0.96	7.92	1.10
	I				13	1	14	0.1	13	15	0.92	9.37	93.6	0.01	0.07	0.01	132.0	0.08	0.69	0.10

APPENDIX II. CARNATION CREEK RAINBOW TROUT.

SEC	AGE	AREA (SQ.M) WET	AREA (SQ.M) RIF	SEC LEN (M)	C1	C2	POP N	VAR N	95 % CONF LIM LOW	95 % CONF LIM UP	P	MEAN WT (GM)	MEAN LEN (MM)	DENSITY FISH/SQ.M WET	DENSITY FISH/SQ.M RIF	DENSITY FISH/SQ.M POOL	WETTED TOT WT (GM)	GM./SQ.M WET	GM./SQ.M RIF	GM./SQ.M POOL
MAY 27-29/85																				
ALL	I	2090	490	417	12	4	18	9.0	12	24	0.67	7.57	89.1	0.01	0.04	0.01	136.3	0.07	0.28	0.09
JULY 22-25/85																				
ALL	0	1289	106	411	184	39	233	26.0	223	244	0.79	0.50	38.4	0.18	2.20	0.20	116.7	0.09	1.10	0.10
	I				24	8	36	18.0	28	44	0.67	10.21	100.8	0.03	0.34	0.03	367.6	0.29	3.47	0.31
SEPT 16-19/85																				
ALL	0	2254	632	408	94	15	112	5.6	107	117	0.84	0.97	46.6	0.05	0.18	0.07	108.5	0.05	0.17	0.07
	I				8	4	16	48.0	2	30	0.50	10.19	101.8	0.01	0.03	0.01	163.0	0.07	0.26	0.10
	II				1	0	1	0.0	1	1	1.00	24.00	141.0	0.00	0.00	0.00	24.0	0.01	0.04	0.01
JUNE 3-5/86																				
ALL	I	2418	538	433	1	0	1	0.0	1	1	1.00	7.25	90.0	0.00	0.00	0.00	7.3	0.00	0.01	0.00
	II				1	0	1	0.0	1	1	1.00	25.30	131.0	0.00	0.00	0.00	25.3	0.01	0.05	0.01
SEPT. 15-17/86																				
II	0	409	12	80	8	0	8	0.0	8	8	1.00	1.57	54.0	0.02	0.67	0.02	12.5	0.03	1.04	0.03
	II				1	0	1	0.0	1	1	1.00	26.44	140.0	0.00	0.08	0.00	26.4	0.06	2.20	0.07
III	0	305	17	54	25	7	35	9.3	29	41	0.72	1.83	56.6	0.11	2.04	0.12	63.4	0.21	3.73	0.22
IV	0	314	53	53	19	4	24	2.6	21	27	0.79	1.75	55.6	0.08	0.45	0.09	42.2	0.13	0.80	0.16
V	0	195	58	71	11	1	12	0.1	11	13	0.91	2.04	61.6	0.06	0.21	0.09	24.7	0.13	0.43	0.18
VI	0	172	48	57	0	1						2.04	66.0							
	I				1	3						11.10	103.2							
	II				3	1	5	2.3	2	8	0.67	21.57	127.0	0.03	0.09	0.04	97.1	0.56	2.02	0.78
VIII	0	181	4	123	0	0	0	0.0												
ALL	0	1576	192	438	63	13	79	8.2	74	85	0.79	1.84	58.1	0.05	0.41	0.06	146.2	0.09	0.76	0.11
	I				1	3						11.10	103.2							
	II				4	1	5	1.0	3	7	0.75	22.54	129.6	0.00	0.03	0.00	120.2	0.08	0.63	0.09

APPENDIX III. CARNATION CREEK CUTTHROAT TROUT.

SEC	AGE	AREA (SQ.M) WET	AREA (SQ.M) RIF	SEC LEN (M)	C1	C2	POP N	VAR N	95 % CONF LIM LOW	95 % CONF LIM UP	P	MEAN WT (GM)	MEAN LEN (MM)	DENSITY FISH/SQ.M WET	DENSITY FISH/SQ.M RIF	DENSITY FISH/SQ.M POOL	WETTED TOT WT (GM)	GM./SQ.M WET	GM./SQ.M RIF	GM./SQ.M POOL
MAY 27-29/85																				
ALL	I	2090	490	417	2	0	2	0.0	2	2	1.00	9.15	92.5	0.00	0.00	0.00	18.3	0.01	0.04	0.01
	II				4	1	5	1.0	3	7	0.75	26.47	138.2	0.00	0.01	0.00	141.2	0.07	0.29	0.09
	III				2	0	2	0.0	2	2	1.00	67.50	196.5	0.00	0.00	0.00	135.0	0.06	0.28	0.08
JULY 22-25/85																				
ALL	0	1289	106	411	2	0	2	0.0	2	2	1.00	0.74	47.0	0.00	0.02	0.00	1.5	0.00	0.01	0.00
	I				1	2						9.95	103.0							
	II				2	1	4	12.0	-3	11	0.50	37.00	155.0	0.00	0.04	0.00	148.0	0.11	1.40	0.13
SEPT 16-19/85																				
ALL	0	2254	632	408	3	0	3	0.0	3	3	1.00	2.56	65.0	0.00	0.00	0.00	7.7	0.00	0.01	0.00
	I				5	2	8	8.6	2	14	0.60	11.44	105.1	0.00	0.01	0.01	95.3	0.04	0.15	0.06
	II				1	0	1	0.0	1	1	1.00	48.05	163.0	0.00	0.00	0.00	48.0	0.02	0.08	0.03
JUNE 3-5/86																				
ALL	0	2418	538	433	2	0	2	0.0	2	2	1.00	0.27	28.5	0.00	0.00	0.00	0.5	0.00	0.00	0.00
	I				2	1	4	12.0	-3	11	0.50	8.44	91.7	0.00	0.01	0.00	33.8	0.01	0.06	0.02
	II				1	0	1	0.0	1	1	1.00	26.93	140.0	0.00	0.00	0.00	26.9	0.01	0.05	0.01
SEPT. 15-17/86																				
ALL	0	1576	192	438	22	3	25	0.8	24	27	0.86	3.11	68.0	0.02	0.13	0.02	79.2	0.05	0.41	0.06
	I				8	0	8	0.0	8	8	1.00	13.04	104.6	0.01	0.04	0.01	104.3	0.07	0.55	0.08
	II				4	0	4	0.0	4	4	1.00	30.61	136.2	0.00	0.02	0.00	122.5	0.08	0.64	0.09

APPENDIX IV. CARNATION CREEK COTTUS ALEUTICUS.

SEC	AGE	AREA (SQ.M) WET	AREA (SQ.M) RIF	SEC LEN (M)	C1	C2	POP N	VAR N	95 % CONF LIM LOW	95 % CONF LIM UP	P	MEAN WT (GM)	MEAN LEN (MM)	DENSITY FISH/SQ.M WET	DENSITY FISH/SQ.M RIF	DENSITY FISH/SQ.M POOL	WETTED TOT WT (GM)	GM./SQ.M WET	GM./SQ.M RIF	GM./SQ.M POOL
MAY 27-29/85																				
II	ALL	401	61	70	29	10	44	25.2	34	54	0.66	4.17	69.9	0.11	0.73	0.13	184.6	0.46	3.03	0.54
III	ALL	299	61	55	3	4						5.88	79.2							
IV	ALL	376	84	54	13	8	34	363.4	-4	72	0.38	7.38	84.4	0.09	0.40	0.12	249.4	0.66	2.97	0.85
V	ALL	305	81	69	11	6	24	118.5	2	46	0.45	7.24	85.2	0.08	0.30	0.11	175.2	0.57	2.16	0.78
VI	ALL	243	50	53	11	4	17	12.1	10	24	0.64	7.72	86.9	0.07	0.35	0.09	133.4	0.55	2.67	0.69
VIII	ALL	466	154	116	4	1	5	1.0	3	7	0.75	8.13	87.2	0.01	0.03	0.02	43.4	0.09	0.28	0.14
ALL	ALL	2089	491	417	71	33	133	273.8	100	166	0.54	6.08	79.2	0.06	0.27	0.08	806.2	0.39	1.64	0.50
JULY 22-25/85																				
II	ALL	224	8	70	41	11	56	13.1	49	63	0.73	4.98	74.7	0.25	7.00	0.26	279.0	1.25	34.88	1.29
III	ALL	291	36	56	13	11	85	30673.5	-266	435	0.15	3.33	65.3	0.29	2.35	0.33	281.4	0.97	7.82	1.10
IV	ALL	227	4	52	24	21	192	141120	-559	943	0.13	5.30	74.2	0.85	48.00	0.86	1017.6	4.48	254.40	4.56
V	ALL	259	39	69	29	19	84	1457.3	8	160	0.34	5.78	76.3	0.32	2.16	0.38	486.1	1.88	12.46	2.21
VI	ALL	179	17	51	6	5	36	9900.0	-163	235	0.17	4.60	71.3	0.20	2.12	0.22	165.6	0.93	9.74	1.02
VIII	ALL	109	1	113	0	0	0													
ALL	ALL	1289	105	411	113	67	278	2304.3	182	374	0.41	5.03	73.6	0.22	2.64	0.23	1396.3	1.08	13.30	1.12
SEPT 16-19/85																				
II	ALL	378	43	69	12	6	24	72.0	7	41	0.50	5.30	76.3	0.06	0.56	0.07	127.2	0.34	2.96	0.38
III	ALL	313	70	53	11	6	24	118.5	2	46	0.45	4.46	71.2	0.08	0.35	0.10	107.9	0.34	1.54	0.44
IV	ALL	392	81	54	16	8	32	96.0	12	52	0.50	7.46	85.6	0.08	0.40	0.10	238.7	0.61	2.95	0.77
V	ALL	331	99	68	19	3	23	1.1	20	25	0.84	7.13	84.5	0.07	0.23	0.10	160.9	0.49	1.62	0.69
VI	ALL	256	68	52	7	0	7	0.0	7	7	1.00	8.06	89.9	0.03	0.10	0.04	56.4	0.22	0.83	0.30
VIII	ALL	584	272	112	2	1	4	12.0	-3	11	0.50	8.93	91.7	0.01	0.01	0.01	35.7	0.06	0.13	0.11
ALL	ALL	2254	633	408	67	24	104	68.8	88	121	0.64	6.49	81.3	0.05	0.16	0.06	677.2	0.30	1.07	0.42

APPENDIX IV. CARNATION CREEK COTTUS ALEUTICUS.

SEC	AGE	AREA (SQ.M) WET	AREA (SQ.M) RIF	SEC LEN (M)	C1	C2	POP N	VAR N	95 % CONF LIM LOW	95 % CONF LIM UP	P	MEAN WT (GM)	MEAN LEN (MM)	DENSITY FISH/SQ.M WET	DENSITY FISH/SQ.M RIF	DENSITY FISH/SQ.M POOL	WETTED TOT WT (GM)	GM./SQ.M WET	GM./SQ.M RIF	GM./SQ.M POOL
JUNE 3-5/86																				
II	ALL	528	63	85	8	9						5.79	77.7							
III	ALL	326	61	54	6	4	18	360.0	-20	56	0.33	6.41	80.8	0.06	0.30	0.07	115.5	0.35	1.89	0.44
IV	ALL	401	90	52	13	6	24	48.1	10	38	0.54	6.24	80.1	0.06	0.27	0.08	150.6	0.38	1.67	0.48
V	ALL	256	115	66	12	6	24	72.0	7	41	0.50	7.85	87.3	0.09	0.21	0.17	188.4	0.74	1.64	1.34
VI	ALL	274	91	63	4	0	4	0.0	4	4	1.00	9.01	92.7	0.01	0.04	0.02	36.0	0.13	0.40	0.20
VIII	ALL	633	118	113	0	1						18.95	113.0							
ALL	ALL	2418	538	433	43	26	109	1032.6	44	173	0.40	7.92	85.9	0.04	0.20	0.06	861.7	0.36	1.60	0.46
SEPT. 15-17/86																				
II	ALL	409	12	80	11	5	20	37.3	8	32	0.55	4.92	76.4	0.05	1.68	0.05	99.3	0.24	8.28	0.25
III	ALL	305	17	54	13	3	17	2.4	14	20	0.77	4.72	74.2	0.06	0.99	0.06	79.7	0.26	4.69	0.28
IV	ALL	314	53	53	18	2	20	0.4	19	22	0.89	7.76	86.2	0.06	0.38	0.08	157.0	0.50	2.96	0.60
V	ALL	195	58	71	10	6	25	225.0	-5	55	0.40	7.17	84.5	0.13	0.43	0.18	179.3	0.92	3.09	1.31
VI	ALL	172	48	57	2	2						11.77	102.5							
VIII	ALL	181	4	123	1	0	1	0.0	1	1	1.00	17.42	114.0	0.01	0.25	0.01	17.4	0.10	4.35	0.10
ALL	ALL	1576	192	438	55	18	82	38.2	69	94	0.67	7.41	85.2	0.05	0.43	0.06	605.8	0.38	3.16	0.44

APPENDIX V. CARNATION CREEK COTTUS ASPER.

SEC	AGE	AREA (SQ.M) WET	AREA (SQ.M) RIF	SEC LEN (M)	C1	C2	POP N	VAR N	95 % CONF LIM LOW	95 % CONF LIM UP	P	MEAN WT (GM)	MEAN LEN (MM)	DENSITY FISH/SQ.M WET	DENSITY FISH/SQ.M RIF	DENSITY FISH/SQ.M POOL	WETTED TOT WT (GM)	GM./SQ.M WET	GM./SQ.M RIF	GM./SQ.M POOL
MAY 27/85																				
II	ALL	401	61	70	7	5	25	918.8	-36	85	0.29	9.88	903.3	0.06	0.40	0.07	242.1	0.60	3.97	0.71
JULY 25/85																				
II	ALL	224	8	70	10	6	25	225.0	-5	55	0.40	8.45	91.6	0.11	3.13	0.12	211.3	0.94	26.41	0.98
SEPT 19/85																				
II	ALL	378	43	69	4	4						12.72	100.8							
JUNE 5/86																				
II	ALL	528	63	85	2	2						5.28	76.7							
SEPT. 15/86																				
II	ALL	409	12	80	7	3	12	17.2	4	21	0.57	8.83	90.7	0.03	1.02	0.03	108.2	0.26	9.01	0.27

APPENDIX VI. CARNATION CREEK TRIBUTARY C CUTTHROAT.

SEC	AGE	AREA (SQ.M) WET	AREA (SQ.M) RIF	SEC LEN (M)	C1	C2	POP N	VAR N	95 % CONF LIM LOW	95 % CONF LIM UP	P	MEAN WT (GM)	MEAN LEN (MM)	DENSITY FISH/SQ.M WET	DENSITY FISH/SQ.M RIF	DENSITY FISH/SQ.M POOL	WETTED TOT WT (GM)	GM./SQ.M WET	GM./SQ.M RIF	GM./SQ.M POOL
MAY 30/85																				
I	I	135	83	59	11	5	20	37.3	8	32	0.55	6.08	83.0	0.15	0.24	0.39	122.6	0.91	1.48	2.36
	II				3	1	5	2.3	2	8	0.67	23.62	131.7	0.03	0.05	0.09	106.3	0.79	1.28	2.04
	III				2	0	2	0.0	2	2	1.00	74.50	204.0	0.01	0.02	0.04	149.0	1.10	1.80	2.87
SEPT 19/85																				
I	0	105	53	56	45	15	68	33.8	56	79	0.67	1.10	47.7	0.64	1.27	1.30	74.3	0.71	1.40	1.43
	I				5	1	6	0.6	5	8	0.80	8.69	97.7	0.06	0.12	0.12	54.3	0.52	1.02	1.04
	II				1	1						29.45	144.0							
	III				1	0	1	0.0	1	1	1.00	47.25	165.0	0.01	0.02	0.02	47.3	0.45	0.89	0.91
JUNE 3/86																				
I	0	143	95	58	2	0	2	0.0	2	2	1.00	1.88	54.0	0.01	0.02	0.04	3.8	0.03	0.04	0.08
	I				6	3	12	36.0	0	24	0.50	5.75	79.4	0.08	0.13	0.25	69.0	0.48	0.73	1.44
	II				1	0	1	0.0	1	1	1.00	25.72	146.0	0.01	0.01	0.02	25.7	0.18	0.27	0.54
	III				1	0	1	0.0	1	1	1.00	31.04	151.0	0.01	0.01	0.02	31.0	0.22	0.33	0.65
SEPT. 16/86																				
I	0	86	42	57	20	8	33	34.6	22	45	0.60	1.51	53.5	0.39	0.79	0.76	50.5	0.59	1.20	1.15
	I				7	1	8	0.3	7	9	0.86	10.59	100.6	0.09	0.19	0.19	86.5	1.01	2.06	1.96
	II				2	0	2	0.0	2	2	1.00	23.66	132.0	0.02	0.05	0.05	47.3	0.55	1.13	1.08

APPENDIX VII. UPPER CARNATION (IX) CUTTHROAT.

SEC	AGE	AREA (SQ.M) WET	AREA (SQ.M) RIF	SEC LEN (M)	C1	C2	POP N	VAR N	95 % CONF LIM LOW	95 % CONF LIM UP	P	MEAN WT (GM)	MEAN LEN (MM)	DENSITY FISH/SQ.M WET	DENSITY FISH/SQ.M RIF	DENSITY FISH/SQ.M POOL	WETTED TOT WT (GM)	GM./SQ.M WET	GM./SQ.M RIF	GM./SQ.M POOL
MAY 30/85																				
IX	I	258	104	79	34	21	89	981.7	26	152	0.38	4.18	72.3	0.34	0.86	0.58	371.7	1.44	3.57	2.41
	II				21	4	26	2.1	23	29	0.81	17.26	117.1	0.10	0.25	0.17	447.7	1.74	4.31	2.91
	III				1	0	1	0.0	1	1	1.00	42.50	162.0	0.00	0.01	0.01	42.5	0.16	0.41	0.28
SEPT 20/85																				
IX	0	238	67	76	15	3	19	1.8	16	21	0.80	1.51	49.9	0.08	0.28	0.11	28.3	0.12	0.42	0.17
	I				24	7	34	10.5	27	40	0.71	7.75	91.2	0.14	0.51	0.20	262.6	1.10	3.92	1.54
	II				2	1	4	12.0	-3	11	0.50	24.11	134.6	0.02	0.06	0.02	96.4	0.41	1.44	0.56
JUNE 5/86																				
IX	I	262	106	73	10	3	14	4.9	10	19	0.70	5.00	74.2	0.05	0.13	0.09	71.4	0.27	0.67	0.46
	II				16	3	20	1.5	17	22	0.81	15.15	114.8	0.08	0.19	0.13	298.3	1.14	2.81	1.91
	III				1	1						0.00	153.0							
SEPT. 18/86																				
IX	0	157	44	73	53	12	69	9.3	62	75	0.77	0.90	43.3	0.44	1.56	0.61	61.5	0.39	1.40	0.54
	I				17	1	18	0.1	17	19	0.94	8.54	94.0	0.12	0.41	0.16	154.3	0.98	3.51	1.37
	II				9	2	12	1.5	9	14	0.78	20.22	125.5	0.07	0.26	0.10	233.9	1.49	5.32	2.07

APPENDIX VIII. UPPER CARNATION CREEK (X) CUTTHROAT.

SEC	AGE	AREA (SQ.M) WET	AREA (SQ.M) RIF	SEC LEN (M)	C1	C2	POP N	VAR N	95 % CONF LIM LOW	95 % CONF LIM UP	P	MEAN WT (GM)	MEAN LEN (MM)	DENSITY FISH/SQ.M WET	DENSITY FISH/SQ.M RIF	DENSITY FISH/SQ.M POOL	WETTED TOT WT (GM)	GM./SQ.M WET	GM./SQ.M RIF	GM./SQ.M POOL
JUNE 6/86																				
X	I	307	43	72	6	8						6.05	82.7							
	II				21	6	29	8.5	24	35	0.71	16.96	118.9	0.10	0.68	0.11	498.7	1.62	11.60	1.89
SEPT. 18/86																				
X	0	228	16	66	26	13	52	156.0	27	77	0.50	1.22	48.6	0.23	3.25	0.25	63.6	0.28	3.97	0.30
	I				32	7	41	5.0	36	45	0.78	8.74	95.2	0.18	2.56	0.19	358.2	1.57	22.39	1.69
	II				12	3	16	3.0	13	19	0.75	19.64	125.8	0.07	1.00	0.08	314.3	1.38	19.64	1.48
	III				1	0	1	0.0	1	1	1.00	48.52	164.0	0.00	0.06	0.00	48.5	0.21	3.03	0.23

APPENDIX IX. USELESS CREEK COHO.

SEC	AGE	AREA (SQ.M) WET	AREA (SQ.M) RIF	SEC LEN (M)	C1	C2	POP N	VAR N	95 % CONF LIM LOW	95 % CONF LIM UP	P	MEAN WT (GM)	MEAN LEN (MM)	DENSITY FISH/SQ.M WET	DENSITY FISH/SQ.M RIF	DENSITY FISH/SQ.M POOL	WETTED TOT WT (GM)	GM./SQ.M WET	GM./SQ.M RIF	GM./SQ.M POOL
AUG 27/85																				
I	0	139	49	57	12	1	13	0.1	12	14	0.92	2.07	56.7	0.09	0.27	0.15	27.1	0.19	0.55	0.30

APPENDIX IX. USELESS CREEK CUTTROAT.

SEC	AGE	AREA (SQ.M) WET	AREA (SQ.M) RIF	SEC LEN (M)	C1	C2	POP N	VAR N	95 % CONF LIM LOW	95 % CONF LIM UP	P	MEAN WT (GM)	MEAN LEN (MM)	DENSITY FISH/SQ.M WET	DENSITY FISH/SQ.M RIF	DENSITY FISH/SQ.M POOL	WETTED TOT WT (GM)	GM./SQ.M WET	GM./SQ.M RIF	GM./SQ.M POOL
AUG 27/85																				
I	0	139	49	57	3	3						0.67	41.2							
	I				5	0	5	0.0	5	5	1.00	7.28	88.6	0.04	0.10	0.06	36.4	0.26	0.74	0.40
	II				3	0	3	0.0	3	3	1.00	16.06	118.3	0.02	0.06	0.03	48.2	0.35	0.98	0.54
	III				1	1						47.42	170.5							

APPENDIX IX. USELESS CREEK COTTUS ALEUTICUS.

SEC	AGE	AREA (SQ.M) WET	AREA (SQ.M) RIF	SEC LEN (M)	C1	C2	POP N	VAR N	95 % CONF LIM LOW	95 % CONF LIM UP	P	MEAN WT (GM)	MEAN LEN (MM)	DENSITY FISH/SQ.M WET	DENSITY FISH/SQ.M RIF	DENSITY FISH/SQ.M POOL	WETTED TOT WT (GM)	GM./SQ.M WET	GM./SQ.M RIF	GM./SQ.M POOL
AUG 27/85																				
I	ALL	139	49	57	26	8	38	14.0	30	45	0.69	4.15	73.2	0.27	0.77	0.42	155.9	1.12	3.18	1.73

APPENDIX X. PACHENA CREEK COHO.

SEC	AGE	AREA (SQ.M) WET	AREA (SQ.M) RIF	SEC LEN (M)	C1	C2	POP N	VAR N	95 % CONF LIM LOW	95 % CONF LIM UP	P	MEAN WT (GM)	MEAN LEN (MM)	DENSITY FISH/SQ.M WET	DENSITY FISH/SQ.M RIF	DENSITY FISH/SQ.M POOL	WETTED TOT WT (GM)	GM./SQ.M WET	GM./SQ.M RIF	GM./SQ.M POOL
AUG 26/85																				
I	0	268	2	63	312	74	409	64.1	393	425	0.76	1.10	45.9	1.53	204.5	1.54	449.9	1.68	224.95	1.69
	I				3	0	3	0.0	3	3	1.00	8.62	92.3	0.01	1.50	0.01	25.9	0.10	12.93	0.10

APPENDIX X. PACHENA CREEK RAINBOW TROUT.

SEC	AGE	AREA (SQ.M) WET	AREA (SQ.M) RIF	SEC LEN (M)	C1	C2	POP N	VAR N	95 % CONF LIM LOW	95 % CONF LIM UP	P	MEAN WT (GM)	MEAN LEN (MM)	DENSITY FISH/SQ.M WET	DENSITY FISH/SQ.M RIF	DENSITY FISH/SQ.M POOL	WETTED TOT WT (GM)	GM./SQ.M WET	GM./SQ.M RIF	GM./SQ.M POOL
AUG 26/85																				
I	0	268	2	63	30	6	38	3.5	34	41	0.80	0.73	42.6	0.14	18.75	0.14	27.4	0.10	13.69	0.10
	I				3	0	3	0.0	3	3	1.00	8.19	95.7	0.01	1.50	0.01	24.6	0.09	12.28	0.09

APPENDIX X. PACHENA CREEK CUTTHROAT TROUT.

SEC	AGE	AREA (SQ.M) WET	AREA (SQ.M) RIF	SEC LEN (M)	C1	C2	POP N	VAR N	95 % CONF LIM LOW	95 % CONF LIM UP	P	MEAN WT (GM)	MEAN LEN (MM)	DENSITY FISH/SQ.M WET	DENSITY FISH/SQ.M RIF	DENSITY FISH/SQ.M POOL	WETTED TOT WT (GM)	GM./SQ.M WET	GM./SQ.M RIF	GM./SQ.M POOL
AUG 26/85																				
I	I	268	2	63	0	2						15.50	116.0							
	II				0	1						25.45	141.0							

APPENDIX X. PACHENA CREEK COTTUS ALEUTICUS.

SEC	AGE	AREA (SQ.M) WET	AREA (SQ.M) RIF	SEC LEN (M)	C1	C2	POP N	VAR N	95 % CONF LIM LOW	95 % CONF LIM UP	P	MEAN WT (GM)	MEAN LEN (MM)	DENSITY FISH/SQ.M WET	DENSITY FISH/SQ.M RIF	DENSITY FISH/SQ.M POOL	WETTED TOT WT (GM)	GM./SQ.M WET	GM./SQ.M RIF	GM./SQ.M POOL
AUG 26/85																				
I	ALL	268	2	63	37	19	76	263.6	44	109	0.49	4.20	72.4	0.28	38.03	0.29	319.4	1.19	159.72	1.20

APPENDIX X. PACHENA CREEK COTTUS ASPER.

SEC	AGE	AREA (SQ.M) WET	AREA (SQ.M) RIF	SEC LEN (M)	C1	C2	POP N	VAR N	95 % CONF LIM LOW	95 % CONF LIM UP	P	MEAN WT (GM)	MEAN LEN (MM)	DENSITY FISH/SQ.M WET	DENSITY FISH/SQ.M RIF	DENSITY FISH/SQ.M POOL	WETTED TOT WT (GM)	GM./SQ.M WET	GM./SQ.M RIF	GM./SQ.M POOL
AUG 26/85																				
I	ALL	268	2	63	18	7	29	27.1	19	40	0.61	8.28	90.9	0.11	14.73	0.11	243.9	0.91	121.94	0.92

APPENDIX XI. RITHERDON CREEK CUTTROAT.

SEC	AGE	AREA (SQ.M) WET	AREA (SQ.M) RIF	SEC LEN (M)	C1	C2	POP N	VAR N	95 % CONF LIM LOW	95 % CONF LIM UP	P	MEAN WT (GM)	MEAN LEN (MM)	DENSITY FISH/SQ.M WET	DENSITY FISH/SQ.M RIF	DENSITY FISH/SQ.M POOL	WETTED TOT WT (GM)	GM./SQ.M WET	GM./SQ.M RIF	GM./SQ.M POOL
AUG 28/85																				
I	0	199	14	69	59	23	97	89.9	78	116	0.61	0.81	43.9	0.49	6.91	0.52	78.3	0.39	5.59	0.42
	I				17	5	24	7.7	19	30	0.71	10.24	101.2	0.12	1.72	0.13	246.6	1.24	17.62	1.33
	II				2	0	2	0.0	2	2	1.00	37.84	157.0	0.01	0.14	0.01	75.7	0.38	5.41	0.41

APPENDIX XII. FISH LENGTH DATA FOR CARNATION CREEK AND OTHER AREA STREAMS

DATE	LOC	GEAR	SPEC	AGE	N	MEAN	SDEV	C.I.MIN	C.I.MAX	RANGE MIN	RANGE MAX
85 Apr 14	FEN	TR	CHUM	0	20	39.20	0.616	38.91	39.49	38	40
85 Apr 18	FEN	TR	CHUM	0	50	40.10	1.074	39.79	40.41	37	43
85 Apr 24	FEN	TR	CHUM	0	59	40.61	1.246	40.29	40.93	37	43
85 Apr 28	FEN	TR	CHUM	0	65	39.97	1.610	39.57	40.37	35	44
85 May 02	FEN	TR	CHUM	0	50	38.96	2.531	38.24	39.68	33	44
85 May 07	FEN	TR	CHUM	0	34	40.00	0.921	39.68	40.32	38	42
85 May 19	FEN	TR	CHUM	0	19	40.21	0.713	39.87	40.55	39	41
85 May 26	FEN	TR	CHUM	0	51	39.78	1.006	39.50	40.07	38	42
85 May 30	FEN	TR	CHUM	0	53	39.98	0.693	39.79	40.17	38	41
85 Mar 29	FEN	TR	COHO	0	65	36.15	1.349	35.82	36.49	33	38
85 Apr 02	FEN	TR	COHO	0	59	36.59	0.768	36.39	36.79	35	39
85 Apr 10	FEN	TR	COHO	0	84	37.85	1.256	37.57	38.12	33	40
85 Apr 18	FEN	TR	COHO	0	50	36.04	1.906	35.50	36.58	33	40
85 Apr 24	FEN	TR	COHO	0	57	36.00	1.626	35.57	36.43	32	39
85 Apr 28	FEN	TR	COHO	0	39	36.00	1.762	35.43	36.57	30	39
85 May 03	FEN	TR	COHO	0	57	35.79	1.688	35.34	36.24	30	39
85 May 07	FEN	TR	COHO	0	59	35.12	2.492	34.47	35.77	31	44
85 Mar 20	FEN	TR	COHO	1	3	82.00	6.000	67.10	96.90	76	88
85 Mar 27	FEN	TR	COHO	1	5	82.40	3.050	78.61	86.19	78	86
85 Apr 03	FEN	TR	COHO	1	7	80.00	9.661	71.05	88.95	68	98
85 Apr 10	FEN	TR	COHO	1	75	86.33	8.966	84.27	88.39	67	107
85 Apr 17	FEN	TR	COHO	1	115	88.18	8.263	86.66	89.71	69	121
85 Apr 24	FEN	TR	COHO	1	208	88.77	6.788	87.85	89.70	69	102
85 May 01	FEN	TR	COHO	1	526	93.94	7.899	93.27	94.62	71	119
85 May 08	FEN	TR	COHO	1	474	93.05	7.622	92.36	93.73	68	118
85 May 15	FEN	TR	COHO	1	230	92.93	6.180	92.13	93.72	71	109
85 May 15	FEN	TR	COHO	1	1	110.00					
85 May 15	FEN	TR	COHO	1	3	115.67	4.042	105.63	125.70	111	118
85 May 22	FEN	TR	COHO	1	31	91.00	6.733	88.53	93.47	73	104
85 May 29	FEN	TR	COHO	1	18	93.33	7.428	89.64	97.03	80	105
85 Jun 05	FEN	TR	COHO	1	12	96.17	6.478	92.05	100.28	87	108
85 Apr 10	FEN	TR	COHO	2	4	107.75	5.188	99.50	116.00	103	114
85 Apr 17	FEN	TR	COHO	2	10	99.60	3.688	96.96	102.24	95	108
85 Apr 17	FEN	TR	COHO	2	1	110.00					
85 Apr 17	FEN	TR	COHO	2	2	118.50	10.607	23.18	213.82	111	126
85 Apr 24	FEN	TR	COHO	2	31	102.48	5.353	100.52	104.45	95	116
85 May 01	FEN	TR	COHO	2	74	103.95	5.472	102.68	105.21	97	120
85 May 08	FEN	TR	COHO	2	30	108.03	6.435	105.64	110.43	101	120
85 May 15	FEN	TR	COHO	2	25	105.08	6.435	102.43	107.73	99	118
85 May 29	FEN	TR	COHO	2	2	114.00	4.243	75.87	152.13	111	117
85 Jun 05	FEN	TR	COHO	2	1	105.00					
85 May 27	2	SPS	COHO	0	189	43.14	5.044	42.42	43.86	33	67
85 May 28	3	SPS	COHO	0	220	43.45	4.244	42.89	44.02	33	63
85 May 29	4	SPS	COHO	0	362	41.75	4.837	41.25	42.24	34	61
85 May 29	5	SPS	COHO	0	209	41.61	5.739	40.83	42.39	32	69

APPENDIX XII (cont'd)

DATE	LOC	GEAR	SPEC	AGE	N	MEAN	SDEV	C.I.MIN	C.I.MAX	RANGE MIN	RANGE MAX
85 May 29	6	SPS	COHO	0	313	40.49	4.751	39.97	41.02	32	62
85 May 28	8	SPS	COHO	0	342	43.36	5.755	42.75	43.97	32	67
85 May 28	8	SPS	COHO	2	1	105.00					
85 May 27	ALL	SPS	COHO	1	2	89.50	12.021	-18.54	197.54	81	98
85 May 28	ALL	SPS	COHO	1	1	96.00					
85 May 29	ALL	SPS	COHO	1	4	83.75	8.539	70.17	97.33	75	95
85 Jul 25	2	SPS	COHO	0	257	56.37	6.158	55.62	57.12	41	77
85 Jul 25	2	SPS	COHO	1	1	81.00					
85 Jul 22	3	SPS	COHO	0	288	56.11	6.570	55.36	56.87	43	80
85 Jul 23	4	SPS	COHO	0	355	50.11	7.005	49.38	50.84	35	74
85 Jul 23	4	SPS	COHO	1	5	85.00	4.000	80.03	89.97	81	91
85 Jul 23	5	SPS	COHO	0	256	53.86	6.588	53.05	54.67	41	78
85 Jul 23	5	SPS	COHO	1	1	99.00					
85 Jul 24	6	SPS	COHO	0	318	51.23	6.144	50.55	51.90	40	76
85 Jul 24	8	SPS	COHO	0	155	57.45	5.505	56.58	58.31	46	76
85 Sep 19	2	SPS	COHO	0	133	58.89	6.570	57.77	60.00	46	87
85 Sep 18	3	SPS	COHO	0	202	61.22	8.359	60.07	62.37	44	84
85 Sep 18	4	SPS	COHO	0	136	53.64	7.786	52.33	54.95	40	76
85 Sep 18	4	SPS	COHO	1	1	80.00					
85 Sep 17	5	SPS	COHO	0	157	56.43	7.965	55.19	57.68	37	83
85 Sep 17	5	SPS	COHO	1	1	103.00					
85 Sep 17	6	SPS	COHO	0	191	54.92	6.923	53.94	55.90	42	82
85 Sep 16	8	SPS	COHO	0	76	60.07	6.851	58.50	61.63	48	77
85 May 28	ALL	SPS	RBT	1	16	89.06	11.693	82.84	95.29	70	114
85 Jul 23	ALL	SPS	RBT	0	223	38.41	4.797	37.78	39.04	33	54
85 Jul 23	ALL	SPS	RBT	1	32	100.81	12.267	96.41	105.21	78	129
85 Sep 17	ALL	SPS	RBT	0	111	46.64	6.564	45.41	47.87	36	65
85 Sep 17	ALL	SPS	RBT	1	12	101.83	6.206	97.89	105.77	94	111
85 Sep 17	ALL	SPS	RBT	2	1	141.00					
85 May 28	ALL	SPS	CUT	1	2	92.50	16.263	-53.67	238.67	81	104
85 May 28	ALL	SPS	CUT	2	5	138.20	17.326	116.66	159.74	126	168
85 May 28	ALL	SPS	CUT	3	2	196.50	13.435	75.75	317.24	187	206
85 Jul 23	ALL	SPS	CUT	0	2	47.00	4.243	8.87	85.13	44	50
85 Jul 23	ALL	SPS	CUT	1	3	99.00	4.583	87.62	110.38	94	103
85 Jul 23	ALL	SPS	CUT	2	3	155.00	12.000	125.21	184.79	143	167
85 Sep 17	ALL	SPS	CUT	0	3	65.00	2.646	58.43	71.57	62	67
85 Sep 17	ALL	SPS	CUT	1	7	105.14	13.057	93.05	117.23	89	129
85 Sep 17	ALL	SPS	CUT	2	1	163.00					
85 May 30	TRBC	S	CUT	1	16	83.00	13.663	75.72	90.28	60	104
85 May 30	TRBC	S	CUT	2	4	131.75	9.605	116.48	147.02	120	141
85 May 30	TRBC	S	CUT	3	2	204.00	32.527	-88.33	496.33	181	227
85 Sep 19	TRBC	S	CUT	0	60	47.72	6.742	45.98	49.46	36	61
85 Sep 19	TRBC	S	CUT	1	6	97.67	10.746	86.39	108.94	86	117
85 Sep 19	TRBC	S	CUT	2	2	144.00	2.828	118.58	169.42	142	146
85 Sep 19	TRBC	S	CUT	3	1	165.00					
85 May 27	2	SPS	ALUT	-	39	69.87	12.905	65.70	74.05	50	95

APPENDIX XII (cont'd)

DATE	LOC	GEAR	SPEC	AGE	N	MEAN	SDEV	C.I.MIN	C.I.MAX	RANGE MIN	RANGE MAX
85 May 28	3	SPS	ALUT	-	6	79.17	12.828	65.71	92.63	64	93
85 May 29	4	SPS	ALUT	-	21	84.38	15.923	77.12	91.64	62	107
85 May 29	5	SPS	ALUT	-	17	85.24	14.481	77.79	92.68	61	111
85 May 29	6	SPS	ALUT	-	15	86.93	12.458	80.05	93.82	62	107
85 May 28	8	SPS	ALUT	-	5	87.20	9.524	75.36	99.04	75	99
85 May 28	ALL	SPS	ALUT	-	103	79.74	15.260	76.76	82.71	50	111
85 Jul 25	2	SPS	ALUT	-	52	74.71	15.072	70.53	78.89	45	127
85 Jul 22	3	SPS	ALUT	-	24	65.29	13.722	59.49	71.09	46	97
85 Jul 23	4	SPS	ALUT	-	45	74.20	19.761	68.28	80.12	50	116
85 Jul 23	5	SPS	ALUT	-	48	76.33	15.576	71.81	80.85	52	112
85 Jul 24	6	SPS	ALUT	-	12	71.33	14.247	62.29	80.38	59	106
85 Sep 18	2	SPS	ALUT	-	18	76.33	13.266	69.74	82.93	50	95
85 Sep 18	3	SPS	ALUT	-	17	71.24	13.321	64.39	78.08	53	96
85 Sep 18	4	SPS	ALUT	-	24	85.63	18.722	77.71	93.54	56	116
85 Sep 17	5	SPS	ALUT	-	22	84.50	17.730	76.64	92.36	61	112
85 Sep 17	6	SPS	ALUT	-	7	89.86	12.020	78.73	100.99	78	108
85 Sep 16	8	SPS	ALUT	-	3	91.67	12.423	60.82	122.51	84	106
85 May 30	9	S	CUT	1	54	72.33	16.967	67.72	76.95	39	121
85 May 30	9	S	CUT	2	28	117.11	18.224	110.05	124.17	87	153
85 May 30	9	S	CUT	3	1	162.00					
85 Sep 20	9	S	CUT	0	19	49.89	15.567	42.40	57.39	31	73
85 Sep 20	9	S	CUT	1	30	91.20	12.400	86.58	95.82	73	116
85 Sep 20	9	S	CUT	2	3	134.67	19.296	86.76	182.57	113	150
85 May 27	2	SPS	ASPR	-	12	90.33	13.269	81.91	98.76	75	114
85 May 28	2-4	SPS	ASPR	-	19	92.53	17.144	84.27	100.79	68	123
85 Jul 25	2	SPS	ASPR	-	16	91.56	11.747	85.31	97.82	72	111
85 Jul 23	2-4	SPS	ASPR	-	28	94.25	16.657	87.80	100.70	69	142
85 Sep 19	2	SPS	ASPR	-	8	95.25	11.273	85.84	104.66	82	109
85 Sep 17	2-4	SPS	ASPR	-	10	100.80	15.704	89.58	112.02	82	130
85 Aug 27	USEL	S	CUT	0	6	41.17	4.167	36.79	45.54	38	47
85 Aug 27	USEL	S	CUT	1	5	88.60	8.112	78.52	98.68	80	96
85 Aug 27	USEL	S	CUT	2	3	118.33	13.577	84.63	152.04	110	134
85 Aug 27	USEL	S	CUT	3	2	170.50	12.021	62.46	278.54	162	179
85 Aug 27	USEL	S	ALUT	-	34	73.15	13.948	68.29	78.00	54	112
85 Aug 27	USEL	S	ASPR	-	1	107.00					
85 Aug 26	PACH	SPS	COHO	0	382	45.90	8.286	45.07	46.73	35	81
85 Aug 26	PACH	SPS	COHO	1	3	92.33	5.508	78.66	106.01	87	98
85 Aug 26	PACH	SPS	RBT	0	36	42.64	4.237	41.21	44.07	30	50
85 Aug 26	PACH	SPS	RBT	1	3	95.67	9.452	72.20	119.13	85	103
85 Aug 26	PACH	SPS	CUT	1	2	116.00	12.728	1.61	230.39	107	125
85 Aug 26	PACH	SPS	CUT	2	1	141.00					
85 Aug 26	PACH	SPS	ALUT	-	56	72.39	10.199	69.67	75.12	50	97
85 Aug 26	PACH	SPS	ASPR	-	25	90.88	12.191	85.86	95.90	68	116
85 Aug 28	RITH	S	CUT	0	84	43.87	5.929	42.58	45.16	31	59
85 Aug 28	RITH	S	CUT	1	22	101.27	12.391	95.78	106.77	84	132
85 Aug 28	RITH	S	CUT	2	2	157.00	21.213	-33.65	347.65	142	172

APPENDIX XII. FISH LENGTH DATA FOR CARNATION CREEK AND OTHER AREA STREAMS

DATE	LOC	GEAR	SPEC	AGE	N	MEAN	SDEV	C.I.MIN	C.I.MAX	RANGE MIN	RANGE MAX
86 Apr 11	FEN	TR	CHUM	0	60	42.03	0.843	41.82	42.25	39	44
86 Apr 12	FEN	TR	CHUM	0	50	41.50	0.735	41.29	41.71	40	43
86 Apr 22	FEN	TR	CHUM	0	32	41.78	1.008	41.42	42.14	39	44
86 Apr 23	FEN	TR	CHUM	0	44	41.57	0.925	41.29	41.85	39	43
86 May 10	FEN	TR	CHUM	0	35	39.46	0.611	39.25	39.67	38	41
86 Mar 22	FEN	TR	COHO	0	37	37.32	1.226	36.92	37.73	35	40
86 Apr 03	FEN	TR	COHO	0	84	36.01	1.418	35.70	36.32	34	40
86 Apr 11	FEN	TR	COHO	0	100	35.60	2.113	35.18	36.02	31	39
86 Apr 25	FEN	TR	COHO	0	56	35.75	1.338	35.39	36.11	32	38
86 May 01	FEN	TR	COHO	0	25	38.48	2.502	37.45	39.51	35	46
86 Jun 05	FEN	TR	COHO	0	32	49.09	3.905	47.69	50.50	39	62
86 Jun 17	FEN	TR	COHO	0	36	50.31	5.025	48.61	52.01	39	60
86 Mar 12	FEN	TR	COHO	1	17	72.88	5.830	69.88	75.88	61	84
86 Mar 19	FEN	TR	COHO	1	87	75.39	7.739	73.74	77.04	59	99
86 Mar 26	FEN	TR	COHO	1	15	76.60	8.236	72.05	81.15	66	94
86 Apr 02	FEN	TR	COHO	1	190	77.26	7.165	76.24	78.28	61	97
86 Apr 09	FEN	TR	COHO	1	477	81.30	8.751	80.51	82.08	60	108
86 Apr 16	FEN	TR	COHO	1	209	86.07	10.292	84.68	87.47	61	110
86 Apr 23	FEN	TR	COHO	1	153	84.48	8.057	83.20	85.75	66	106
86 Apr 30	FEN	TR	COHO	1	390	89.16	7.202	88.44	89.87	66	108
86 May 07	FEN	TR	COHO	1	566	88.42	7.675	87.78	89.05	66	110
86 May 14	FEN	TR	COHO	1	201	89.87	6.647	88.95	90.78	73	108
86 May 21	FEN	TR	COHO	1	123	89.27	6.407	88.14	90.40	72	105
86 May 28	FEN	TR	COHO	1	51	89.96	5.036	88.54	91.38	78	99
86 Jun 04	FEN	TR	COHO	1	24	88.29	5.489	85.97	90.61	78	99
86 Apr 09	FEN	TR	COHO	2	5	114.20	6.099	106.62	121.78	111	125
86 Apr 16	FEN	TR	COHO	2	9	113.56	6.540	108.52	118.59	105	124
86 Apr 23	FEN	TR	COHO	2	10	98.20	6.973	93.22	103.18	88	106
86 Apr 30	FEN	TR	COHO	2	24	107.25	7.764	103.97	110.53	98	127
86 May 07	FEN	TR	COHO	2	9	99.22	9.391	91.99	106.45	92	113
86 May 14	FEN	TR	COHO	2	15	103.73	12.498	96.83	110.64	92	133
86 May 21	FEN	TR	COHO	2	6	96.33	3.327	92.84	99.82	93	101
86 May 28	FEN	TR	COHO	2	1	135.00					
86 Jun 05	2	SPS	COHO	0	115	48.40	4.275	47.61	49.19	39	60
86 Jun 04	3	SPS	COHO	0	51	48.63	5.796	47.00	50.26	34	61
86 Jun 04	3	SPS	COHO	1	9	81.00	4.000	77.92	84.08	76	87
86 Jun 04	4	SPS	COHO	0	185	48.38	4.566	47.73	49.04	39	60
86 Jun 04	4	SPS	COHO	1	3	72.33	8.737	50.64	94.02	65	82
86 Jun 04	5	SPS	COHO	0	16	48.44	4.066	46.27	50.60	41	58
86 Jun 04	5	SPS	COHO	1	2	69.50	12.021	-38.54	177.54	61	78
86 Jun 03	6	SPS	COHO	0	3	51.67	3.512	42.95	60.39	48	55
86 Jun 03	6	SPS	COHO	1	1	72.00					
86 Jun 03	8	SPS	COHO	0	1	51.00					
86 Sep 15	2	SPS	COHO	0	142	67.94	5.325	67.07	68.82	55	87
86 Sep 15	2	SPS	COHO	1	2	83.50	0.707	77.15	89.86	83	84

APPENDIX XII (cont'd)

DATE	LOC	GEAR	SPEC	AGE	N	MEAN	SDEV	C.I.MIN	C.I.MAX	RANGE MIN	RANGE MAX
86 Sep 16	3	SPS	COHO	0	82	72.11	6.238	70.74	73.48	60	87
86 Sep 16	3	SPS	COHO	1	8	96.88	5.793	92.04	101.71	60	104
86 Sep 16	4	SPS	COHO	0	113	64.06	7.107	62.74	65.39	51	81
86 Sep 16	4	SPS	COHO	1	2	90.00	2.828	64.58	115.42	88	92
86 Sep 17	5	SPS	COHO	0	43	70.28	5.779	68.51	72.05	57	84
86 Sep 17	6	SPS	COHO	0	32	78.75	5.418	76.81	80.69	68	88
86 Sep 17	6	SPS	COHO	1	2	94.00	4.243	55.87	132.13	91	97
86 Jun 05	TOTL	SPS	RBT	1	1	90.00					
86 Jun 04	TOTL	SPS	RBT	2	1	131.00					
86 Sep 15	2	SPS	RBT	0	8	54.00	5.976	49.01	58.99	45	64
86 Sep 15	2	SPS	RBT	2	1	140.00					
86 Sep 16	3	SPS	RBT	0	32	56.59	4.079	55.13	58.06	48	68
86 Sep 16	4	SPS	RBT	0	23	55.57	8.190	52.03	59.10	40	67
86 Sep 17	5	SPS	RBT	0	12	61.58	4.699	58.60	64.57	53	66
86 Sep 17	6	SPS	RBT	0	1	66.00					
86 Sep 17	6	SPS	RBT	1	4	103.25	8.057	90.44	116.06	95	114
86 Sep 17	6	SPS	RBT	2	4	127.00	12.247	107.53	146.47	114	141
86 Jun 04	TOTL	SPS	CUT	0	2	28.50	2.121	9.43	47.57	27	30
86 Jun 04	TOTL	SPS	CUT	1	3	91.67	9.074	69.14	114.19	85	102
86 Jun 04	TOTL	SPS	CUT	2	1	140.00					
86 Sep 16	TOTL	SPS	CUT	0	25	68.04	11.043	63.49	72.59	52	89
86 Sep 16	TOTL	SPS	CUT	1	8	104.63	10.555	95.82	113.43	86	118
86 Sep 16	TOTL	SPS	CUT	2	4	136.25	10.595	119.40	153.10	130	152
86 Jun 05	2	SPS	ALUT	-	17	77.71	13.869	70.57	84.84	60	116
86 Jun 04	3	SPS	ALUT	-	10	80.80	18.293	67.73	93.87	57	114
86 Jun 04	4	SPS	ALUT	-	19	80.11	15.340	72.71	87.50	52	108
86 Jun 04	5	SPS	ALUT	-	18	87.28	14.020	80.31	94.25	62	113
86 Jun 03	6	SPS	ALUT	-	4	92.75	6.850	81.86	103.64	85	99
86 Jun 03	8	SPS	ALUT	-	1	113.00					
86 Sep 15	2	SPS	ALUT	-	16	76.44	9.605	71.32	81.55	65	97
86 Sep 16	3	SPS	ALUT	-	16	74.19	13.177	67.17	81.20	56	96
86 Sep 16	4	SPS	ALUT	-	20	86.15	14.759	79.25	93.05	60	123
86 Sep 17	5	SPS	ALUT	-	16	84.50	14.783	76.63	92.37	67	112
86 Sep 17	6	SPS	ALUT	-	4	102.50	2.380	98.72	106.28	100	105
86 Sep 17	8	SPS	ALUT	-	1	114.00					
86 Jun 04	2/3	SPS	ASPR	-	7	92.29	23.265	70.74	113.83	61	119
86 Sep 15	2	SPS	ASPR	-	10	90.70	8.731	84.46	96.94	73	104
86 Jun 03	TR.C	S	CUT	0	2	54.00	2.828	28.58	79.42	52	56
86 Jun 03	TR.C	S	CUT	1	9	79.44	9.501	72.13	86.76	66	96
86 Jun 03	TR.C	S	CUT	2	1	146.00					
86 Jun 03	TR.C	S	CUT	3	1	151.00					
86 Sep 16	TR.C	S	CUT	0	28	53.54	7.100	50.79	56.29	40	71
86 Sep 16	TR.C	S	CUT	1	8	100.63	13.606	89.27	111.98	82	121
86 Sep 16	TR.C	S	CUT	2	2	132.00	18.385	-33.23	297.23	119	145
86 Jun 05	9	S	CUT	1	12	74.25	17.421	63.19	85.31	53	95
86 Jun 05	9	S	CUT	2	20	114.75	13.162	108.60	120.90	98	138

APPENDIX XII (cont'd)

DATE	LOC	GEAR	SPEC	AGE	N	MEAN	SDEV	C.I.MIN	C.I.MAX	RANGE MIN	RANGE MAX
86 Jun 05	9	S	CUT	3	2	153.00	4.243	114.87	191.13	150	156
86 Sep 18	9	S	CUT	0	65	43.28	8.135	41.27	45.28	24	58
86 Sep 18	9	S	CUT	1	18	94.00	13.539	87.27	100.73	71	113
86 Sep 18	9	S	CUT	2	11	125.45	15.591	114.97	135.94	96	153
86 Jun 06	10	S	CUT	1	14	82.71	11.945	75.82	89.61	68	102
86 Jun 06	10	S	CUT	2	27	118.93	11.945	114.19	123.66	104	141
86 Sep 18	10	S	CUT	0	39	48.62	6.961	46.36	50.87	32	60
86 Sep 18	10	S	CUT	1	39	95.77	8.449	93.04	98.50	82	116
86 Sep 18	10	S	CUT	2	15	125.80	9.987	120.28	131.32	113	146
86 Sep 18	10	S	CUT	3	1	164.00					

APPENDIX XIII. FISH LENGTH-WEIGHT DATA AND CONDITION FACTOR (K).

Date	Location	Section	Species	age	n	K	a (x10-5)	b
1985								
April 13	Carnation	FEN	Coho	1	38	1.048	1.783	2.881
				2	3	1.040	924.800	1.552
April 24	Carnation	FEN	Coho	1	20	1.000	0.564	3.126
May 7	Carnation	FEN	Coho	1	18	1.014	1.264	2.952
				2	3	1.045	0.380	3.214
May 27	Carnation	II	Coho	0	21	1.029	0.283	3.342
May 29	Carnation	V	Coho	0	11	1.067	0.488	3.195
May 29	Carnation	VI	Coho	0	24	0.954	0.312	3.302
May 28	Carnation	VIII	Coho	0	12	1.135	108.300	1.894
May 27	Carnation	All	Coho	1	7	1.058	14.350	2.421
July 25	Carnation	II	Coho	0	27	1.053	2.828	2.759
				1	1	1.073		
July 24	Carnation	VI	Coho	0	29	1.072	0.761	3.090
Sep. 19	Carnation	II	Coho	0	32	1.072	0.635	3.130
Sep. 18	Carnation	III	Coho	0	41	1.091	0.721	3.101
Sep. 18	Carnation	IV	Coho	0	37	1.018	0.588	3.135
				1	1	1.064		
Sep. 17	Carnation	V	Coho	0	31	0.986	0.823	3.049
				1	1	1.089		
Sep. 17	Carnation	VI	Coho	0	32	0.995	0.713	3.085
Sep. 16	Carnation	VIII	Coho	0	29	1.069	0.265	3.338
May 27	Carnation	All	Rainbow	1	14	1.037	5.943	2.611
July 24	Carnation	All	Rainbow	1	15	0.962	2.583	2.786
				0	24	0.835	0.344	3.243
Sep. 17	Carnation	All	Rainbow	0	27	0.842	0.040	3.801
				1	12	0.955	1.869	2.855
				2	1	0.856		
May 28	Carnation	All	CUT	1	2	1.146	43.140	2.196
				2	3	0.972	2.220	2.832
				3	1	0.961		
July 23	Carnation	All	CUT	1	1	0.911		
				0	4	0.857	0.001	4.824
Sep. 17	Carnation	All	CUT	0	6	0.864	0.377	3.216
				1	9	0.922	0.138	3.410
				2	1	1.110		
May 27	Carnation	II	Aleuticus	All	26	1.107	1.046	3.014
May 29	Carnation	V	Aleuticus	All	11	1.103	1.967	2.867
May 29	Carnation	VI	Aleuticus	All	15	1.117	2.458	2.824
May 28	Carnation	VIII	Aleuticus	All	5	1.180	0.264	3.336

APPENDIX XIII (cont'd)

Date	Location	Section	Species	age	n	K	a (x10-5)	b
1985								
July 25	Carnation	II	Aleuticus	All	32	1.051	0.853	3.050
July 24	Carnation	VI	Aleuticus	All	10	1.125	0.261	3.335
Sep. 19	Carnation	II	Aleuticus	All	18	1.088	0.204	3.383
Sep. 18	Carnation	III	Aleuticus	All	17	1.101	0.391	3.242
Sep. 18	Carnation	IV	Aleuticus	All	24	1.022	1.511	2.919
Sep. 17	Carnation	V	Aleuticus	All	22	1.033	0.494	3.166
Sep. 17	Carnation	VI	Aleuticus	All	7	1.071	3.954	2.710
Sep. 16	Carnation	VIII	Aleuticus	All	3	1.087	0.021	3.875
May 27	Carnation	II	Asper	All	7	1.214	0.445	3.229
July 25	Carnation	II	Asper	All	16	1.041	0.494	3.166
Sep. 18	Carnation	2-4	Asper	All	10	1.128	0.559	3.157
May 30	Carnation	TRBC	CUT	1	16	1.029	7.945	2.534
				2	4	1.016	0.099	3.478
				3	2	0.863	15.820	2.452
Sep. 19	Carnation	TRBC	CUT	0	28	0.939	0.247	3.346
				1	6	0.911	1.129	2.952
				2	2	0.985	0.119	3.425
				3	1	1.052		
May 30	Carnation	9	CUT	1	11	0.918	0.572	3.113
				2	9	0.985	4.361	2.695
				3	1	1.000		
Sep. 20	Carnation	9	CUT	0	19	0.948	1.032	2.978
				1	30	0.973	0.724	3.064
				2	3	0.945	0.649	3.077
Aug. 27	Useless	I	Coho	0	13	1.115	0.400	3.253
Aug. 27	Useless	I	CUT	0	6	0.921	0.204	3.406
				1	5	1.049	104.900	1.971
				2	3	0.942	0.775	3.041
				3	2	0.954	76.800	2.146
Aug. 27	Useless	I	Aleuticus	All	26	0.944	0.690	3.074
Aug. 27	Useless	I	Asper	All	1	0.971		
Aug. 26	Pachena	I	Coho	0	38	1.034	0.315	3.302
				1	3	1.089	3.530	2.740
Aug. 26	Pachena	I	Rainbow	0	12	0.914	0.138	3.503
Aug. 26	Pachena	I	Rainbow	1	3	0.925	4.680	2.644
Aug. 26	Pachena	I	CUT	1	1	0.993		
				2	1	0.908		
Aug. 26	Pachena	I	Aleuticus	All	17	1.046	0.732	3.082
Aug. 26	Pachena	I	Asper	All	15	1.040	1.785	2.883
Aug. 28	Ritherdon	I	CUT	0	25	0.926	0.698	3.071
				1	22	0.947	0.948	2.999
				2	2	0.961	6.824	2.612

APPENDIX XIII (cont'd)

Date	Location	Section	Species	age	n	K	a (x10-5)	b
1986								
April 7	Carnation	FEN	Coho	1	38	0.974	1.292	2.937
April 24	Carnation	FEN	Coho	1	17	0.960	4.857	2.632
April 25	Carnation	FEN	Coho	1	19	0.975	0.388	3.206
				2	1	0.912		
May 5	Carnation	FEN	Coho	1	50	0.942	1.310	2.926
May 10	Carnation	FEN	Coho	1	29	0.957	0.452	3.167
				2	1	0.951		
May 17	Carnation	FEN	Coho	1	14	0.974	0.572	3.118
				2	1	1.007		
May 18	Carnation	FEN	Coho	1	21	1.018	6.989	2.572
June 5	Carnation	II	Coho	0	19	1.038	0.169	3.464
June 4	Carnation	III	Coho	0	19	1.038	0.283	3.334
				1	4	1.138	0.730	3.101
June 4	Carnation	V	Coho	0	16	1.172	2.589	2.795
				1	2	1.409	3.025	2.820
June 3	Carnation	VI	Coho	0	3	1.275	1.660	2.934
				1	1	1.479		
June 3	Carnation	VIII	Coho	0	1	1.395		
Sep. 15	Carnation	II	Coho	0	25	1.106	0.703	3.106
				1	1	1.098		
Sep. 16	Carnation	III	Coho	0	6	1.085	0.102	3.539
				1	6	1.134	0.177	3.405
Sep. 17	Carnation	V	Coho	0	18	1.074	0.273	3.323
Sep. 17	Carnation	VI	Coho	0	7	1.141	5.470	2.643
				1	1	1.297		
June 5	Carnation	II	Rainbow	1	1	0.995		
June 4	Carnation	V	Rainbow	2	1	1.125		
Sep. 15	Carnation	II	Rainbow	0	6	0.962	1.092	2.969
				2	1	0.964		
Sep. 16	Carnation	III	Rainbow	0	8	0.995	0.543	3.149
Sep. 17	Carnation	V	Rainbow	0	5	0.859	0.937	2.979
Sep. 17	Carnation	VI	Rainbow	1	4	0.993	1.898	2.861
				2	4	1.016	0.018	3.834
June 5	Carnation	All	CUT	0	1	1.037		
				1	3	1.050	8.865	2.017
				2	1	0.981		
Sep. 15	Carnation	II	CUT	0	1	0.995		
				1	1	0.951		
				2	3	0.987	2.622	6.107

APPENDIX XIII (cont'd)

Date	Location	Section	Species	age	n	K	a (x10-5)	b
1986								
Sep. 16	Carnation	III	Cut	0	3	1.002	3.849	2.103
				2	1	1.015		
Sep. 17	Carnation	V	CUT	0	5	0.959	1.736	3.419
				1	1	0.858		
Sep. 17	Carnation	VI	CUT	0	9	0.940	0.328	3.240
				1	5	1.107	0.725	3.091
June 5	Carnation	II	Aleuticus	All	17	1.109	0.458	3.203
June 4	Carnation	III	Aleuticus	All	10	1.056	0.273	3.302
June 4	Carnation	IV	Aleuticus	All	19	1.099	0.514	3.170
June 4	Carnation	V	Aleuticus	All	18	1.096	0.578	3.142
June 3	Carnation	VI	Aleuticus	All	4	1.130	148.500	1.922
June 3	Carnation	VIII	Aleuticus	All	1	1.313		
Sep. 15	Carnation	II	Aleuticus	All	9	1.054	0.954	3.023
Sep. 16	Carnation	III	Aleuticus	All	13	1.056	0.825	3.057
Sep. 16	Carnation	IV	Aleuticus	All	18	1.118	8.383	2.554
Sep. 17	Carnation	V	Aleuticus	All	10	1.081	1.586	2.917
Sep. 17	Carnation	VI	Aleuticus	All	2	1.090	0.042	3.702
June 4	Carnation	II	Asper	All	4	1.030	0.545	3.146
June 5	Carnation	III	Asper	All	3	1.229	0.030	3.787
Sep. 15	Carnation	II	Asper	All	7	1.135	0.008	4.087
June 3	Carnation	TR.C	CUT	0	2	1.184	0.018	4.050
				1	9	1.111	4.936	2.660
				2	1	0.826		
				3	1	0.902		
Sep. 16	Carnation	TR.C	CUT	0	28	0.940	0.924	3.004
				1	8	0.988	0.211	3.332
				2	2	0.989	0.122	3.429
June 6	Carnation	10	CUT	1	14	1.011	0.550	3.136
				2	27	0.983	1.043	2.987
June 5	Carnation	9	CUT	1	10	1.121	2.510	2.805
				2	17	0.976	1.754	2.875
				3	1	0.956		
Sep. 18	Carnation	9	CUT	0	26	0.976	0.986	3.005
				1	18	0.981	1.422	2.917
				2	11	0.984	0.825	3.036
				3	1	0.956		
Sep. 18	Carnation	10	CUT	0	6	1.033	0.214	3.394
Sep. 18	Carnation	10	CUT	1	18	0.991	1.710	2.881
				2	12	0.984	7.319	2.583
				3	1	1.100		